# Solenoid Valve

Motor Valve
Air Operated Valve
Emergency Shutoff System

# Solenoid Valve Selection

| Application | | | | | | Working Pressure (MPa) | Max. Temperature (˚C) | Model | Type | | | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Steam | Air | Water | Oil | Nitrogen Gas | Heavy Oil A / Light Oil | | | | Piston | Diaphragm | Direct Acting | |
| ● | | | | | | 0-0.12 | 120 | DD-1S | | | ● | 188 |
| ● | ● | ● | ● | ● | | 0-0.15 | 175 | DD-2 | | | ● | 187 |
| ● | | | | | | 0-0.5 | 160 | DD-1S-5 | | | ● | 188 |
| ● | ● | ● | ● | | | 0-0.7 | 170 | DD-1S-7 | | | ● | 188 |
| ● | ● | ● | ● | ● | | 0-0.8 | 175 | DD-2-8 | | | ● | 187 |
| ● | ● | ● | ● | | | 0-1.0 | 180 | DP-100 | ● | | | 175 |
| ● | ● | ● | ● | | | | | DP-100F | ● | | | 175 |
| ● | ● | ● | ● | | | 0.05-1.0 | | DP-10 | ● | | | 178 |
| ● | ● | ● | ● | | | | | DP-13 | ● | | | 178 |
| | ● | ● | ● | | | 0-0.12 | 120 | DD-1W | | | ● | 188 |
| | ● | ● | ● | ● | | 0-0.15 | 100 | DD-3 | | | ● | 187 |
| | ● | ● | ● | | | 0-0.5 | 120 | DD-1W-5 | | | ● | 188 |
| | ● | ● | ● | | | 0-0.7 | | DD-1W-7 | | | ● | 188 |
| | ● | ● | ● | ● | | 0-0.8 | 100 | DD-3-8 | | | ● | 187 |
| | ● | ● | ● | | | 0-1.0 | 60 | DP-12 | | ● | | 181 |
| | ● | ● | ● | | | | | DP-12-N | | ● | | 181 |
| | ● | ● | ● | | | | | DP-14 | | ● | | 181 |
| | ● | ● | ● | | | | | DP-14-N | | ● | | 181 |
| | ● | ● | ● | | | | | DP-16 | | ● | | 182 |
| | ● | ● | ● | | | | | DP-18 | | ● | | 182 |
| | ● | ● | | ● | ● | 0.05-1.6 | | DP-34 | ● | | | 197 |

# Motor Valve Selection

| Application | | | | Working Pressure (MPa) | Max. Temperature (˚C) | Model | Type | | Page |
|---|---|---|---|---|---|---|---|---|---|
| Steam | Air | Water | Oil | | | | Two Way Type | Three Way Type | |
| ● | | | | 0-0.6 | 160 | MD-54 | ● | | 190 |
| | ● | ● | | 0-1.0 | 80 | MD-35R | | ● | 197 |
| | ● | ● | | | | MD-36R | ● | | 191 |
| | ● | ● | | | | MD-53 | ● | | 197 |
| | ● | ● | | | | MD-55 | ● | | 197 |
| | ● | ● | | | | MD-61 | ● | | 197 |
| | ● | ● | | | 120 | MD-54 | ● | | 190 |

# Air Operated Valve Selection

| Application | | | | Working Pressure (MPa) | Max. Temperature (˚C) | Model | Type | Page |
|---|---|---|---|---|---|---|---|---|
| Steam | Air | Water | Oil | | | | Diaphragm | |
| ● | ● | ● | ● | 0-1.0 | 180 | PD-1 | ● | 192 |
| ● | ● | ● | ● | | | PD-2 | ● | 192 |

# Selection of Solenoid Valve

## What is a Solenoid Valve ??

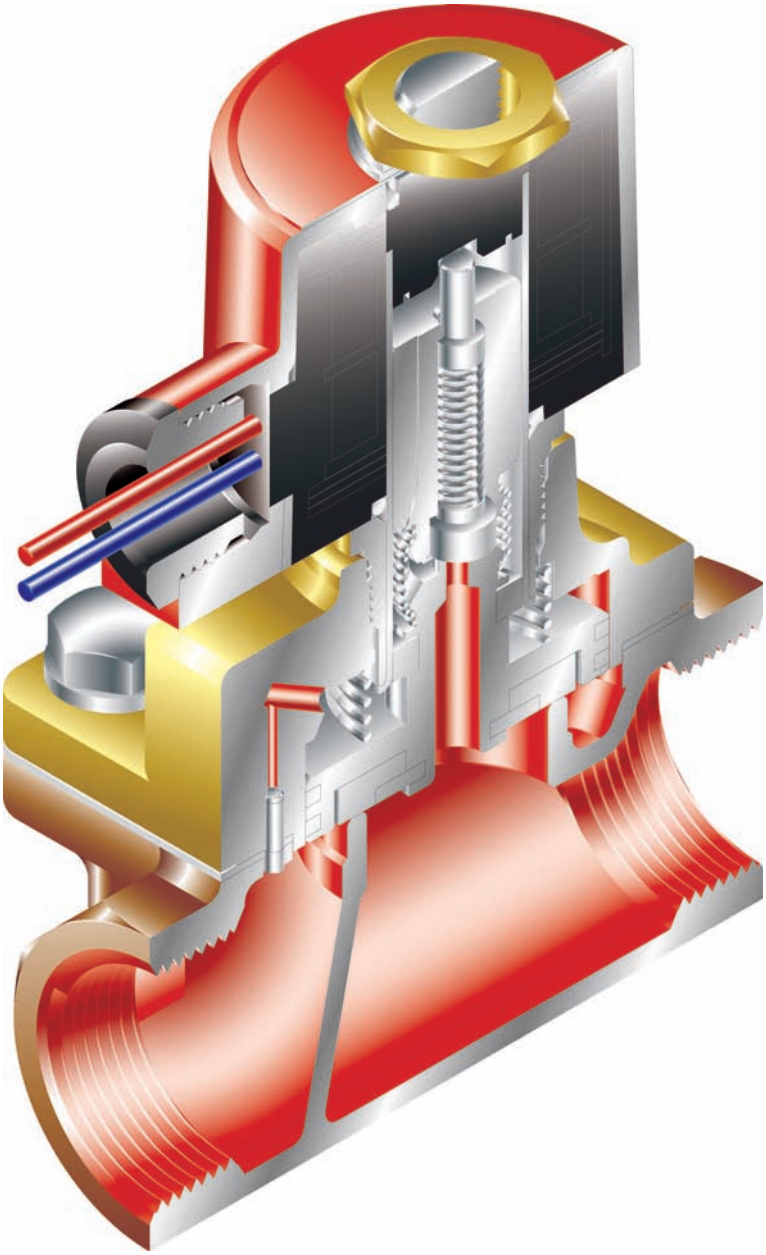
A solenoid valve opens/closes by moving a piece of steel called "plunger" by magnetic force of solenoid, and is applied to the flow control (on-off control) in the piping for fluids. The solenoid valve opens/closes more quickly than a motor valve.

| | | | |
|---|---|---|---|
| **Applications** | ・Water supply and drainage for general households<br>・Plant facilities<br>・Industrial machine | ・Air-conditioning facilities<br>・Building facilities<br>・Plant facilities | ・Air-conditioning facilities<br>・Building facilities<br>・Plant facilities |
| **Types** | **Direct acting type**<br>Directly opens/closes the valve disc by attraction effect of electromagnet. | **Pilot operated type**<br>Opens/closes the valve disc by opening/closing its pilot valve by attraction effect of electromagnet. | |
| | | **Piston type**<br>Piston works as the main valve. | **Diaphragm type**<br>Diaphragm works as the main valve. |
| | Features wide application for fluids such as air, water, oil, steam, etc. and reliable operation by simple structure. | The DP-10 Series meets the demands for high reliability of automatic control devices as the automation of process grows in various industrial fields. The series has a wide variety of compact pilot operated types and satisfies each purpose and application. | |
| **Major Products** | **DD-1 Series**<br>  <br>Compact, lightweight and space-saving | **DP-10 Series**<br>  <br>・Applicable to all kinds of fluid<br>・Easy to maintain | **DP-12 Series**<br>  <br>・Actuates with no differential pressure<br>・No leakage |

## Best Selection Chart

| Requirement | | 1st recommendation | 2nd recommendation |
|---|---|---|---|
| High-speed response | Steam | DP-100・100F | DP-10 Series |
| | Cold and hot water | DP-12 Series | PD Series |
| Water hammer prevention | Steam | MD-54 | |
| | Cold and hot water | MD Series | PD Series + speed controller |
| No rubber material (Stainless steel, PTFE) | | DP-100・100F | MD Series |
| Easy maintenance | | DP・DD Series | |
| Manual operation | | MD Series | |
| On/Off switch | | MD Series | |
| Usable in explosion-proof area | | DP-34 | PD Series |
| Less scale problems | | PD Series | MD Series |
| Lightweight, compact and space-saving | | DD Series | DP Series |

# Features of Pilot Operated Piston Type ＜DP-10 Series＞



## 1: Ass'y Plunger

Plunger, spring, disc and etc. are combined in one unit, resulting in easy maintenance.

## 2: Double piston ring

Excellent sliding motion and tight sealing are achieved by double piston ring.

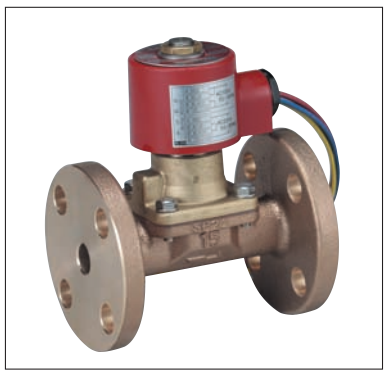
## 3: Molded coil

- The coil protective structure complies with splashproof requirements of JIS C 0920.
- Class H molded coil provides excellent insulation from high temperature.

## 4: Trim parts made of stainless steel

All of major internal parts such as valve disc, plunger, spring, and etc. are made of stainless steel or PTFE and is excellent in corrosion resistance.

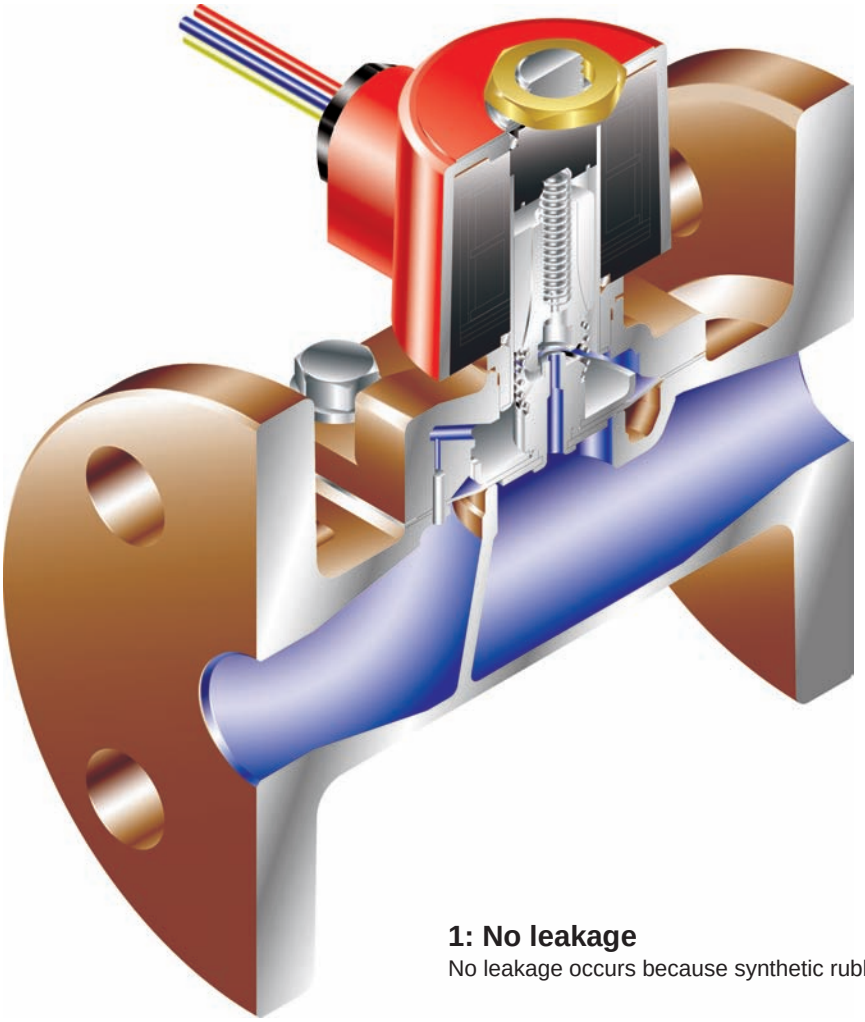
## 5: Variations



DP-13

DP-10C

# Features of Pilot Operated Diaphragm Type ＜DP-12 Series＞



### 1: No leakage
No leakage occurs because synthetic rubber valve is used.

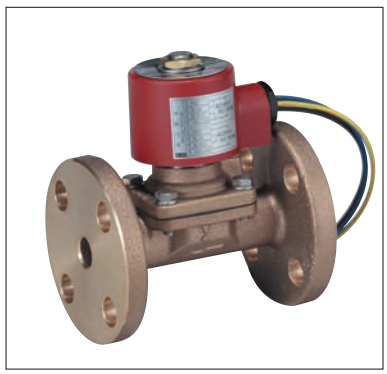
### 2: Less scale problems
Less scale problems occurs because the valve opens/closes by diaphragm and has no sliding parts.

### 3: Horizontal or vertical installation as desired

### 4: Anti-water hammer
Available with anti-water hammer structure on request.

### 5: Variations

DP-12



DP-14

DP-16

# Codes for Solenoid Valve

## IP Codes

IEC 529 outlines an international classification system for the sealing effectiveness of enclosure of Electrical equipment against the intrusion into equipment of foreign bodies and moisture.
This classification system utilities the letter "IP" (Ingress Protection) followed by two digits.

- **First character**
  The first character of the IP code indicates the degree of protection against the ingress of solid foreign objects.
- **Second character**
  The second character indicates the degree of protection against the ingress of water with harmful effects.

| 1st character | Degrees of Protection Against Solid Foreign Objects Entering the Enclosure |
|---|---|
| 0 | Not protected |
| 1 | Protected against solid foreign objects larger than 50 mm in diameter |
| 2 | Protected against solid foreign objects larger than 12.5 mm in diameter |
| 3 | Protected against solid foreign objects larger than 2.5 mm in diameter |
| 4 | Protected against solid foreign objects larger than 1 mm in diameter |
| 5 | Dust protected |
| 6 | Dust tight |

| 2nd character | Degrees of Protection Against Water | JIS C0920 |
|---|---|---|
| 0 | Not protected | — |
| 1 | Protected against vertically falling water drops | Drip-proof I |
| 2 | Protected against vertically falling water drops when enclosure is tilted us at a 15 degree angle | Drip-proof II |
| 3 | Protected against water sprayed at up to a 60 degree angle | Rain-proof |
| 4 | Protected against splashing water from any directions | Splash-proof |
| 5 | Protected against water jets from any directions | Water jets-proof |
| 6 | Protected against powerful water jets from any directions | Heavy water jets-proof |
| 7 | Protected against temporary immersion in water | Emersion-proof |
| 8 | Protected against submersion | Submersible type |

## Description of Pressure- and Explosion-proof Code

**d 2 G4**

Degree of ignition
G1: Ignition temperature of more than 450˚C
G2: Ignition temperature of more than 300˚C up to 450˚C
G3: Ignition temperature of more than 200˚C up to 300˚C
G4: Ignition temperature of more than 135˚C up to 200˚C
G5: Ignition temperature of more than 100˚C up to 135˚C
G6: Ignition temperature of more than 85˚C up to 100˚C

Explosion class
Minimum value of clearance with the depth of 25 mm, which causes the transmission of flame
1: More than 0.6 mm (Ex. Propane gas)
2: More than 0.4 mm up to 0.6 mm (Ex. Ethylene)
3: 0.4 mm or less (Ex. Hydrogen (3a))

Type of explosion-proof structure
d: Pressure- and explosion-proof structure (Zone 1, 2)
e: Explosion-proof structure for increased safety structure (Zone 2)
i : Explosion-proof structure for intrinsic safety (Zone 0)

## Types of Zone where Explosion-proof Solenoid Valve is Used

**Zone 0**
Ignitable concentrations present continuously or for long periods of time
Ex.) Vicinity of the surface of combustible liquid

**Zone 1**
Ignitable concentrations likely to exist under normal operations
Ex.) Vicinity of the opening which often emits combustible gas while inspection or repair work of products

**Zone 2**
Ignitable concentrations not likely to exist under normal operations, or may exist for a short time only (twice or three times per year)
Ex.) A place where combustible gas may ingress due to corrosion or deterioration of a vessel , or vicinity of rupture disk

# Nominal Size Selection for Solenoid Valve

## Calculation Formula for Cv Value

(1) For steam

When $P_2 > \frac{P_1}{2}$ $\quad Cv = \frac{Wk}{138\sqrt{\Delta P\,(P_1 + P_2)}}$

When $P_2 \leqq \frac{P_1}{2}$ $\quad Cv = \frac{Wk}{120P_1}$

(2) For gas

When $P_2 > \frac{P_1}{2}$ $\quad Cv = \frac{Q}{2940}\sqrt{\frac{(273 + t)\,G}{\Delta P\,(P_1 + P_2)}}$

When $P_2 \leqq \frac{P_1}{2}$ $\quad Cv = \frac{Q\sqrt{(273 + t)\,G}}{2560P_1}$

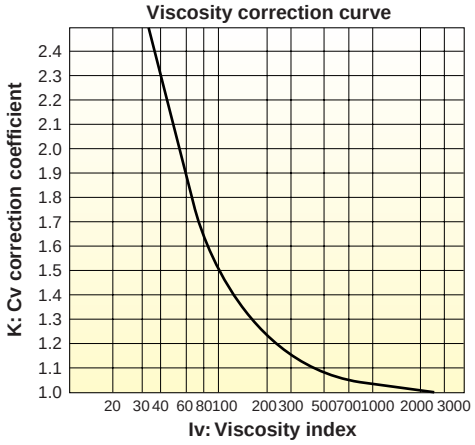
(3) For liquid

$Cv = \frac{0.365V\sqrt{G}}{\sqrt{\Delta P}}$

W: Max. steam flow rate [kg/h]
$P_1$: Inlet pressure [MPa・A]
$P_2$: Outlet pressure [MPa・A]
$\Delta P$: $P_1 - P_2$ [MPa]
k : 1 + 0.0013 x {superheated steam temp. [˚C] – saturated steam temp. [˚C] }
Q : Max. gas flow rate [m³/h (standard condition)]
G : Specific gravity (relative to air for gas, or relative to water for liquid)
t : Fluid temperature [˚C]
V : Max. liquid flow rate [m³/h]
Cv: Cv value of each nominal size
Iv : Viscosity index
Mcst: Viscosity [cSt]

## Formula for Correction of Viscosity

$Iv = \frac{72780}{Mcst}\left(\frac{\Delta P}{G}\right)^{\frac{1}{4}} V^{\frac{1}{2}}$




## Cv Value Table

| Model \ Nominal size | 10A | 15A | 20A | 25A | 32A | 40A | 50A | 65A |
|---|---|---|---|---|---|---|---|---|
| DP-100 | 3 | 4.5 | 7.5 | 12 | 17.7 | 25 | 33.6 | |
| DP-100F | | 4.5 | 7.5 | 12 | 17.7 | 25 | 33.6 | 33.6 |
| DP-10・13 | 3.1 | 4.9 | 8.2 | 12.4 | 17.7 | 25.0 | 33.6 | 33.6 |
| DP-12・12-N・14・14-N・16・18 | 3.0 | 4.4 | 8.1 | 11.5 | 17.0 | 23.3 | 30.5 | |
| DP-34 | | 4.5 | 8.6 | 12.6 | | | | |
| DD-1S・1W・2・3 | 1.7 | 1.7 | 1.7 | | | | | |
| DD-1S-5・1W-5 | 0.75 | 0.75 | 0.75 | | | | | |
| DD-1S-7・1W-7・2-8・3-8 | 0.55 | 0.55 | 0.55 | | | | | |
| MD-35R | | 3 | 6 | 8 | | | | |
| MD-36R | | 6 | 11 | 15 | | | | |
| MD-53 | | 12 | 16 | 28 | 47 | 83 | 123 | |
| MD-54 | | 9 | 13 | 24 | 44 | 80 | 120 | |
| PD-1・2 | | 5 | 7 | 11 | 16 | 24 | 40 | |

## Terminal Box (Made of Plastics)

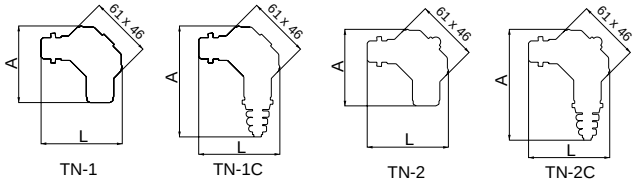
The terminal box is for both indoor and outdoor, and can be attached to DP-100・10 Series.


TN-1


TN-1C


TN-2


TN-2C

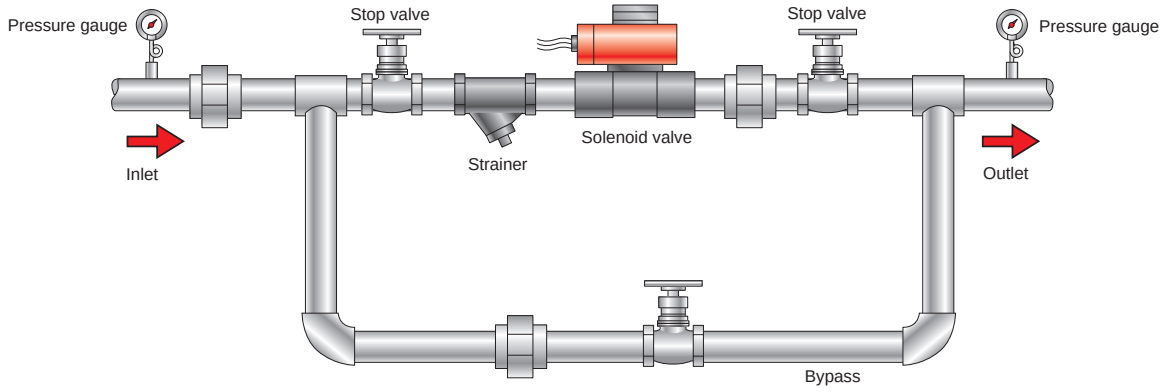



| Model | Specifications | IP Code | Dimensions L x A mm |
|---|---|---|---|
| TN-1 | Standard terminal box | Rain-proof (IP 03) | 80 x 76 |
| TN-1C | With cab tire cable | Splash-proof (IP 54) | 80 x 110 |
| TN-2 | With indication light | Rain-proof (IP 03) | 80 x 76 |
| TN2C | With indication light and cab tire cable | Splash-proof (IP 54) | 80 x 110 |

・Please specify the rated voltage (AC 100 V or AC 200 V) when ordering terminal box.
・The TN-2 and TN-2C cannot be used for DC voltage.

# Guidelines for Installing Solenoid Valve

## Piping Example



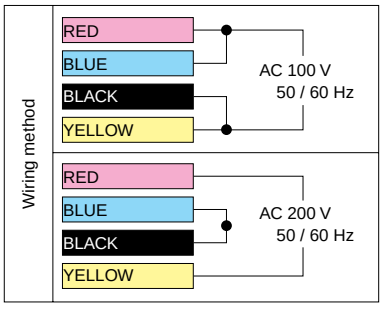

- Vertical or horizontal installation is possible including the intermediates between vertical and horizontal positions, however, do not install it upside-down.
- When used at less than 0.1 MPa pressure, the valve should be installed horizontally with the coil up. The vertical installation is limited to the condition that the differential pressure between the inlet and outlet sides is 0.1 MPa or more.

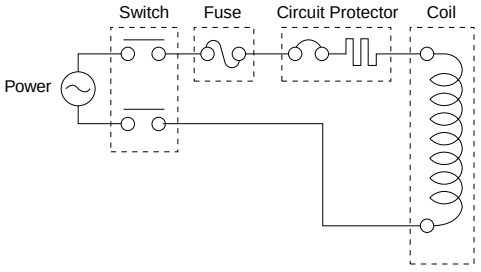
### ⚠ Warning and caution for installation

1. Before connecting the product to piping, remove foreign substances and scales inside the piping. Note that the seal material must not flow into the inside of the product.
2. When installation, check the direction of the product so that the fluid flowing and the arrow marked on the product are in the same direction.
3. As shown in the above figure, it is recommended that stop valves, strainers, pressure gauges and bypass line be installed to the piping. For screwed valve, a union joint is recommended to install for easy maintenance and inspection.
4. Make sure to install a strainer with the mesh size 80-100 at the inlet side of the product.
5. Avoid over-tightening of screw and excessive stress imposed from the piping in order to prevent malfunction due to the distortion of the body.
6. Vertical or horizontal installation is possible, however, the coil must be installed above the horizontal level.
7. Secure a space required for disassembly or removal of the product at the time of maintenance and inspection.
8. Solenoid valve and motor valve are not explosion-proof. Do not use them in the area or ambience where explosive gasses accumulate.
9. When using at the outdoor, set eaves to avoid direct rain.

## Wiring Method (DP-10 Series)

AC coil




DC coil

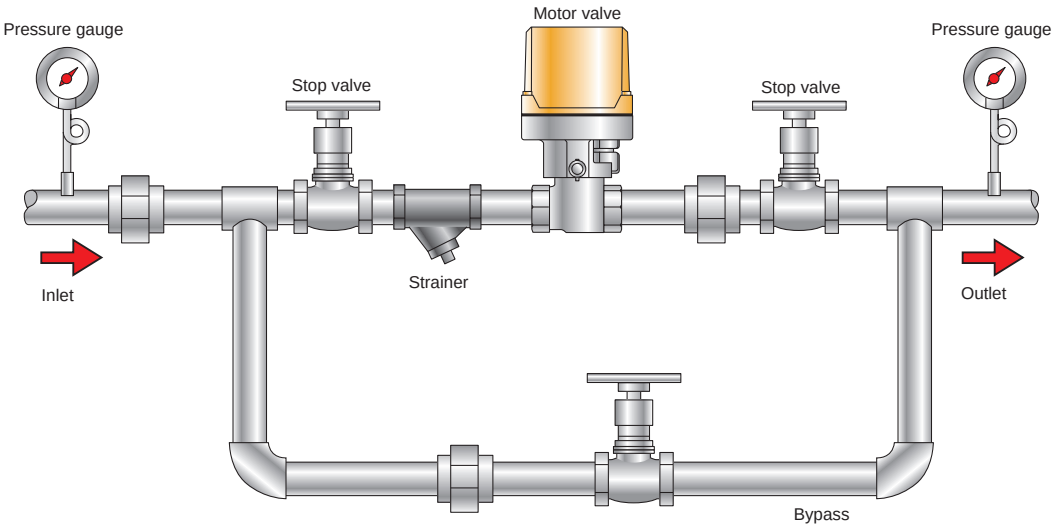
- DC coil has two lead wires (red and black). Connect each of them to + and – (the correspondence relation is undecided).

1. Method of wire binding differs between the voltages AC 100 V and AC 200 V. Bind the lead wires of the coil according to the instruction label attached on the side of the coil. In order to prevent faulty or erroneous wiring when in a dark or narrow space, it is recommended that each of the lead wires be clearly identified with different colors that can be easily recognized.
2. In order to prevent disconnection or insulation failure, do not pull the lead wires or subject them to an excessive load while binding or using them.
3. Use an electric wire with wire core of 0.75 $mm^2$ or more.
4. Install a fuse (2-3A) to protect the electric circuit. Additionally, if the product is used in a fuel supply system, install a circuit protector of a rated ampere shown below.

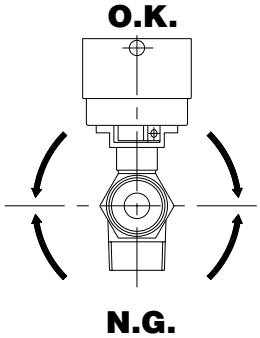
Rated voltage 100 / 110 V: 0.5A (10A to 25A), 0.75A (32A to 65A)
Rated voltage 200 / 220 V: 0.3A (10A to 25A), 0.5A (32A to 65A)

# Guidelines for Installing Motor Valve

## Piping Example




### Installation posture

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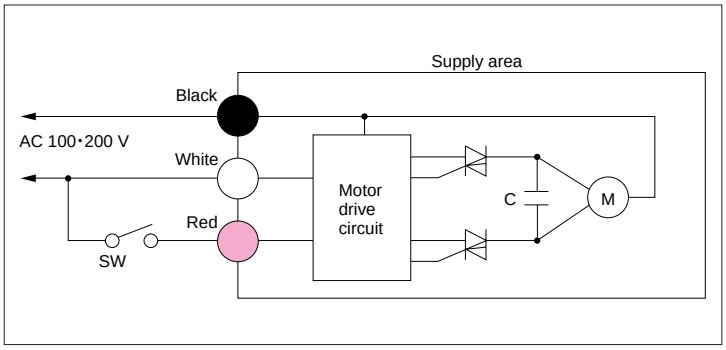
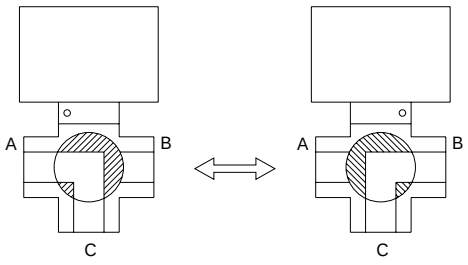
3. As shown in the above figure, it is recommended that stop valves, strainers, pressure gauges and bypass line be installed to the piping. For screwed valve, a union joint is recommended to install for easy maintenance and inspection.
4. Make sure to install a strainer with the mesh size 80-100 at the inlet side of the product.
5. Avoid over-tightening of screw and excessive stress imposed from the piping in order to prevent malfunction due to the distortion of the body.
6. Vertical or horizontal installation is possible, however, the coil must be installed above the horizontal level.
7. Secure a space required for disassembly or removal of the product at the time of maintenance and inspection.
8. Solenoid valve and motor valve are not explosion-proof. Do not use them in the area or ambience where explosive gasses accumulate.
9. When using at the outdoor, set eaves to avoid direct rain.

## Wiring Method (MD-35R･36R)



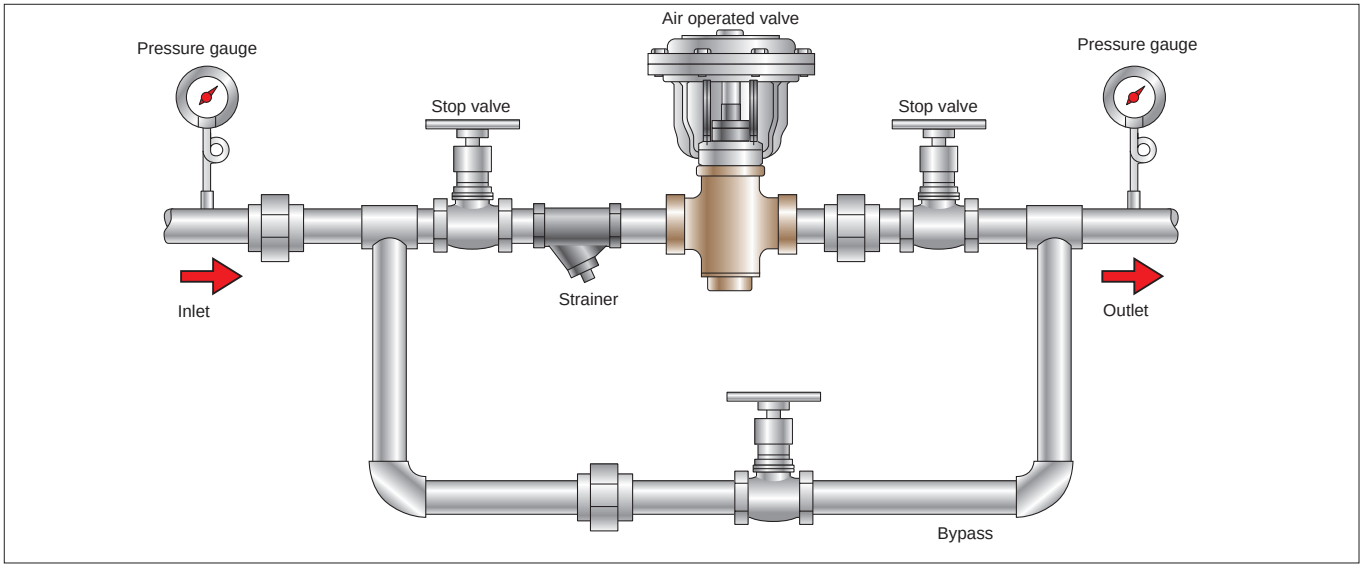

- MD-36R: Valve closes when SW is OFF.
  Valve opens when SW is ON.
- MD-35R: Passage is from A to C when SW is OFF.
  Passage is from B to C when SW is On.

**[Switch direction (MD-35R)]**



# Guidelines for Installing Air Operated Valve

## Piping Example

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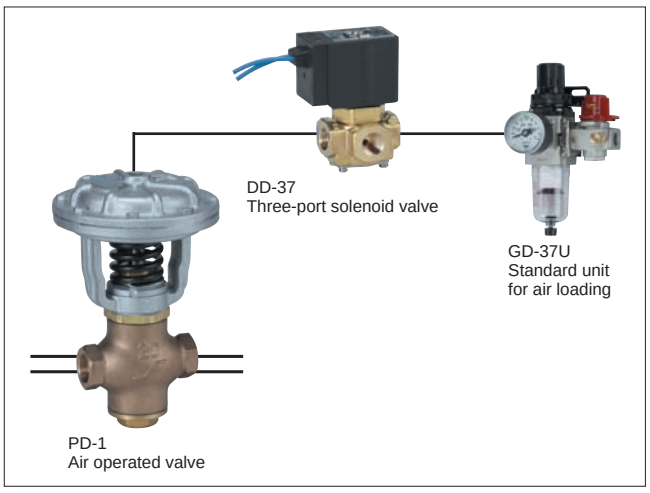
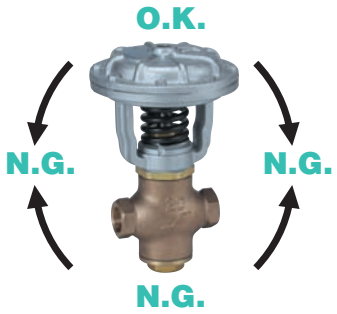



### ●Installation posture




Install the air operated valve vertically (the air pressure inlet port must be faced upward).

# DD-100·100F

DP-100 <10A-25A>

DP-100 <32A-50A>

DP-100F <15A-25A>

DP-100F <32A-65A>

## Features

1. Ultra-high performance technology gives high precision in performance.
2. Three-times more durability than our conventional models.
3. ASM (Anti-Sticking Mechanism) for three-times more scale resistance.
4. Body and main parts made of stainless steel give higher corrosion resistance, making usable for clean fluid.
5. A combined internal component enables easy cartridge replacement with this product installed.

## Specifications

| Model | | DP-100 | DP-100F |
|---|---|---|---|
| Application | | Steam, Air, Cold and hot water, $N_2$ gas, $CO_2$ gas (dry), Ar gas, Oil (20 cSt or less) | |
| Working pressure | | 0-1.0 MPa (unusable under vacuum) | |
| Min. differential pressure | | 0 MPa (0.03 MPa or more is required for vertical installation) | |
| Allowable valve seat leakage | | 50 mL/min under standard conditions (at air pressure of 0.6 MPa) | |
| Temperature range | | 5-180˚C (no freeze condition) | |
| Operation | | Normally closed | |
| Material | Body | Cast stainless steel (SCS14A) | |
| | Piston | Stainless steel (SCS14A) | |
| | Valve disc | PTFE | |
| Connection | | JIS Rc screwed | JIS 10K FF flanged |
| Size | | 10A-50A | 15A-65A |

## Specifications of Coil

| Rated voltage | AC 100 / 200 V selective type | | AC 110 / 220 V selective type | |
|---|---|---|---|---|
| | 50 / 60 Hz common | | | |
| Nominal size | 10-25A | 32-65A | 10-25A | 32-65A |
| Allowable fluctuation | Reted voltage -5% to + 10% | | | |
| Rated current | 0.34 / 0.17 A | 0.46 / 0.23 A | 0.32 / 0.16 A | 0.42 / 0.21 A |
| Starting current | 1.64 / 0.82 A | 1.90 / 0.95 A | 1.48 / 0.74 A | 1.80 / 0.90 A |
| Insulation class | Insulation class H | | | |
| Protective structure | Dust tight, Splash proof | | | |
| Ingress protection code | IP64 (JIS C0920) | | | |
| Insulation resistance | 50 MΩ and more / 500 V megger | | | |
| Withstand voltage test | 1500 V/min | | | |

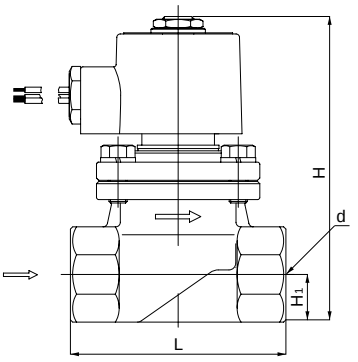

**10A-25A**


**32A-50A**

## Dimensions (mm) and Weights (kg)

### ●DP-100

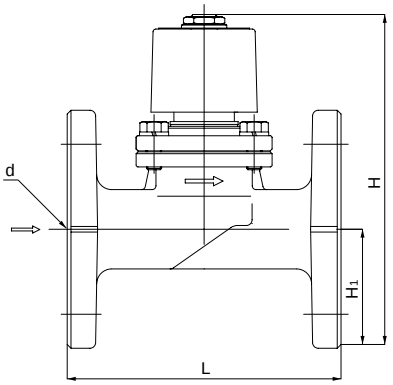
| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 127 | 14.5 | 1.4 |
| 15A | Rc 1/2 | 70 | 127 | 14.5 | 1.4 |
| 20A | Rc 3/4 | 80 | 131 | 17.5 | 1.5 |
| 25A | Rc 1 | 95 | 135 | 21.0 | 1.9 |
| 32A | Rc 1-1/4 | 110 | 172 | 26.0 | 3.1 |
| 40A | Rc 1-1/2 | 120 | 178 | 29.5 | 4.0 |
| 50A | Rc 2 | 140 | 187 | 36.5 | 5.6 |




**DP-100**

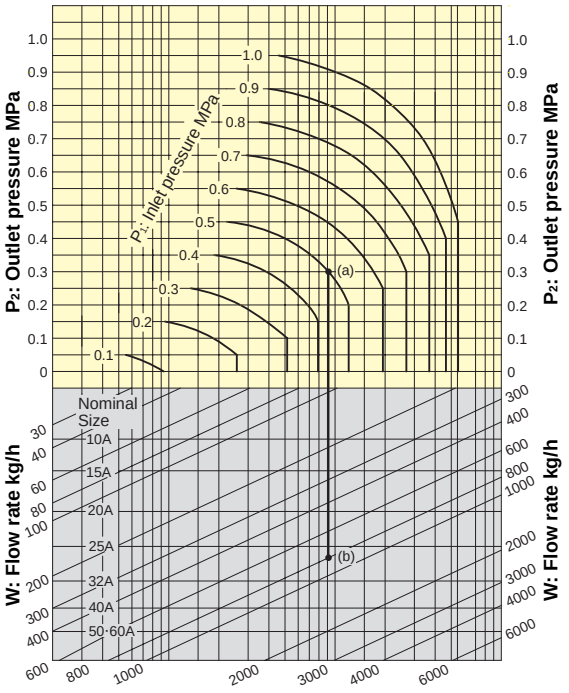
### ●DP-100F

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 161 | 47.5 | 2.7 |
| 20A | 20 | 130 | 164 | 50.0 | 3.2 |
| 25A | 25 | 145 | 177 | 62.5 | 4.5 |
| 32A | 32 | 160 | 213 | 67.5 | 6.9 |
| 40A | 40 | 170 | 219 | 70.0 | 8.0 |
| 50A | 50 | 195 | 228 | 77.5 | 10.5 |
| 65A | 65 | 198 | 238 | 87.5 | 12.3 |




**DP-100F**

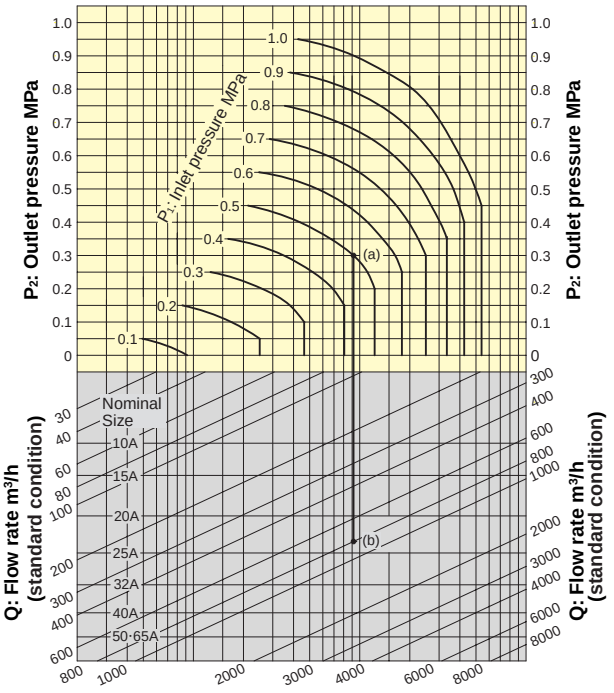
## Nominal Size Selection Chart (For Steam)




**How to use the chart**

When selecting the nominal size of a solenoid valve whose inlet pressure ($P_1$), outlet pressure ($P_2$), and steam (saturated steam) flow rate (W) are 0.5 MPa, 0.3 MPa, and 800 kg/h, respectively, first find intersection point (a) of $P_1$ = 0.5 MPa and $P_2$ = 0.3 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with W = 800 kg/h. Since this intersection point (b) lies between nominal sizes 25A and 32A, select the larger one, 32A.

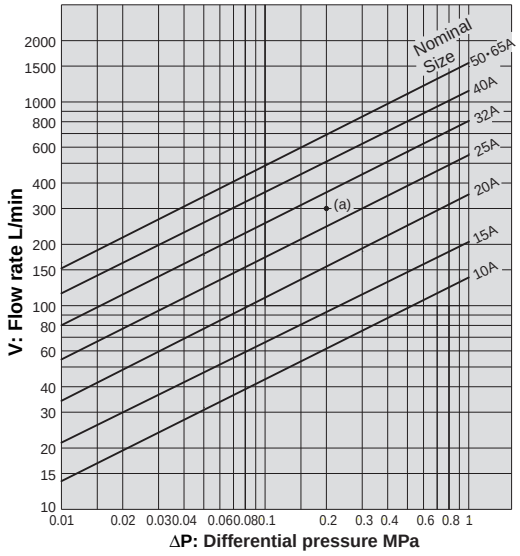
## Nominal Size Selection Chart (For Air)




**How to use the chart**

When selecting the nominal size of a solenoid valve whose inlet pressure ($P_1$), outlet pressure ($P_2$), and air (20˚C) flow rate (Q) are 0.5 MPa, 0.3 MPa, and 800 m³/h (standard condition), respectively, first find intersection point (a) of $P_1$ = 0.5 MPa and $P_2$ = 0.3 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with Q = 800 m³/h (standard condition). Since this intersection point (b) lies between nominal sizes 20A and 25A, secect the larger one, 25A.

## Nominal Size Selection Chart (For Water)




**How to use the chart**

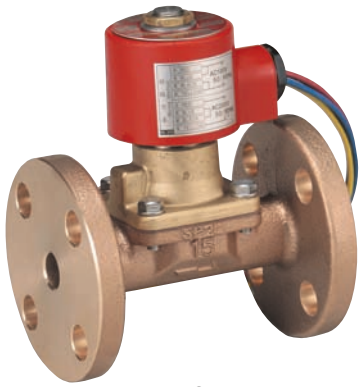
When selecting the nominal size of a solenoid valve whose inlet pressure ($P_1$), outlet pressure ($P_2$), and flow rate (V) are 0.5 MPa, 0.3 MPa, and 300 L/min, respectively, first find intersection point (a) of the differential pressure before and after the valve [$\Delta P$ = 0.5 – 0.3 = 0.2 MPa] and V = 300 L/min. Since this intersection point (a) lies between nominal sizes 25A and 32A, select the larger one, 32A.

# DP-10·13 Series

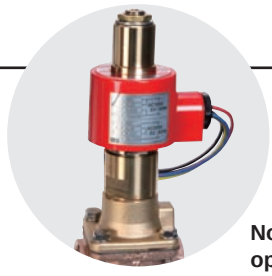
## Features

1. Excellent performance on fluid control, mainly used for steam.
2. Compact, lightweight and large capacity.
3. Horizontal and vertical installation.

DP-10



DP-13



Normally opened type

DC coil type

### ●Piston Type Solenoid Valves Variation

| Voltage and operation | AC voltage | | DC voltage | |
|---|---|---|---|---|
| | Normally closed | Normally opened | Normally closed | Normally opened |
| Screwed type | DP-10 | DP-10C | DP-10D | DP-10CD |
| Flanged type | DP-13 | DP-13C | DP-13D | DP-13CD |

## Specifications

| Model | AC coil | **DP-10** | **DP-13** | **DP-10C** | **DP-13C** |
|---|---|---|---|---|---|
| | DC coil | **DP-10D** | **DP-13D** | **DP-10CD** | **DP-13CD** |
| Application | | Steam, Air, Cold and hot water, Oil (20 cSt or less) | | | |
| Working pressure | | 0.05-1.0 MPa (unusable under vacuum) | | | |
| Min. differential pressure | | 0.05 MPa (0.1 MPa or more is required for vertical installation) | | | |
| Valve seat leakage | | 50 mL/min (at the time of air pressure 0.6 MPa) | | | |
| Max. temperature | | 180˚C | | | |
| Operation | | Normally closed | | Normally opened | |
| Material | Body | Cast bronze | | | |
| | Piston | Stainless steel | | | |
| | Valve disc | PTFE | | | |
| Connection | | JIS Rc screwed | JIS 10K FF flanged | JIS Rc screwed | JIS 10K FF flanged |

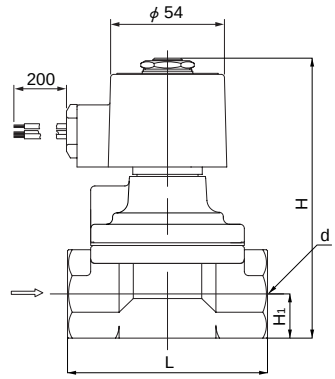
・Available with working pressure of 0 to 0.10 MPa (DP-□□L (D)).

## Dimensions (mm) and Weights (kg)

### ●DP-10

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 119 | 14.5 | 1.2 |
| 15A | Rc 1/2 | 70 | 119 | 14.5 | 1.2 |
| 20A | Rc 3/4 | 80 | 126 | 17.5 | 1.4 |
| 25A | Rc 1 | 95 | 133 | 21.0 | 1.8 |
| 32A | Rc 1-1/4 | 110 | 155 | 26.0 | 2.6 |
| 40A | Rc 1-1/2 | 120 | 162 | 29.5 | 3.2 |
| 50A | Rc 2 | 140 | 177 | 36.5 | 5.1 |

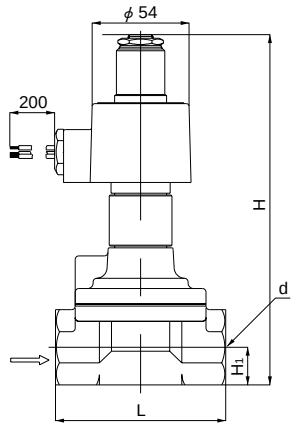
DP-10




### ●DP-10C

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 182 | 14.5 | 1.5 |
| 15A | Rc 1/2 | 70 | 182 | 14.5 | 1.5 |
| 20A | Rc 3/4 | 80 | 189 | 17.5 | 1.7 |
| 25A | Rc 1 | 95 | 196 | 21.0 | 2.1 |
| 32A | Rc 1-1/4 | 110 | 218 | 26.0 | 2.9 |
| 40A | Rc 1-1/2 | 120 | 225 | 29.5 | 3.5 |
| 50A | Rc 2 | 140 | 239 | 36.5 | 5.4 |

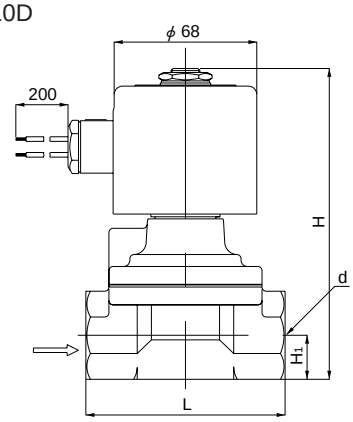
DP-10C




### ●DP-10D

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 134 | 14.5 | 2.0 |
| 15A | Rc 1/2 | 70 | 134 | 14.5 | 2.0 |
| 20A | Rc 3/4 | 80 | 141 | 17.5 | 2.2 |
| 25A | Rc 1 | 95 | 148 | 21.0 | 2.6 |
| 32A | Rc 1-1/4 | 110 | 170 | 26.0 | 3.4 |
| 40A | Rc 1-1/2 | 120 | 177 | 29.5 | 4.0 |
| 50A | Rc 2 | 140 | 192 | 36.5 | 5.9 |

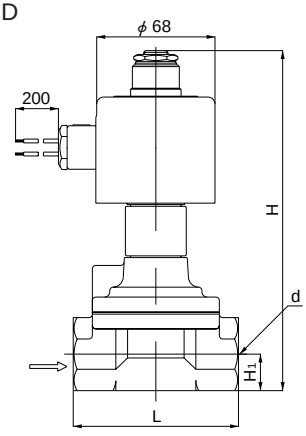
DP-10D




### ●DP-10CD

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 182 | 14.5 | 2.2 |
| 15A | Rc 1/2 | 70 | 182 | 14.5 | 2.2 |
| 20A | Rc 3/4 | 80 | 189 | 17.5 | 2.4 |
| 25A | Rc 1 | 95 | 196 | 21.0 | 2.8 |
| 32A | Rc 1-1/4 | 110 | 218 | 26.0 | 3.6 |
| 40A | Rc 1-1/2 | 120 | 225 | 29.5 | 4.5 |
| 50A | Rc 2 | 140 | 239 | 36.5 | 6.1 |

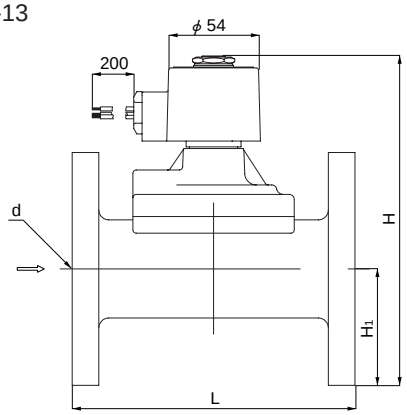
DP-10CD



## ●DP-13

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 152.0 | 47.5 | 2.7 |
| 20A | 20 | 130 | 158.5 | 50.0 | 3.3 |
| 25A | 25 | 145 | 174.5 | 62.5 | 4.8 |
| 32A | 32 | 160 | 196.5 | 67.5 | 6.6 |
| 40A | 40 | 170 | 202.5 | 70.0 | 7.3 |
| 50A | 50 | 195 | 217.5 | 77.5 | 10.0 |
| 65A | 50 | 198 | 227.5 | 87.5 | 13.5 |

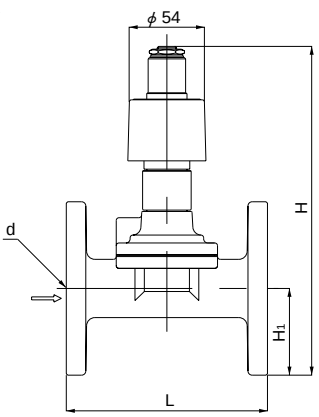
DP-13




## ●DP-13C

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 215 | 47.5 | 3.0 |
| 20A | 20 | 130 | 221 | 50.0 | 3.6 |
| 25A | 25 | 145 | 237 | 62.5 | 5.1 |
| 32A | 32 | 160 | 259 | 67.5 | 6.9 |
| 40A | 40 | 170 | 265 | 70.0 | 7.6 |
| 50A | 50 | 195 | 280 | 77.5 | 10.3 |

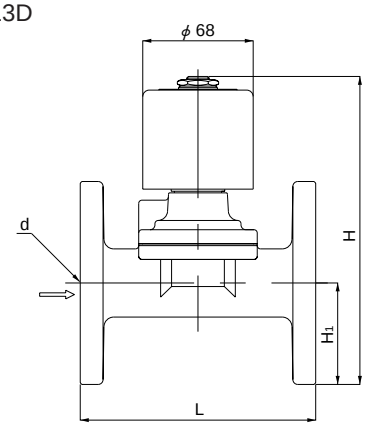
DP-13C




## ●DP-13D

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 167 | 47.5 | 3.5 |
| 20A | 20 | 130 | 174 | 50.0 | 4.1 |
| 25A | 25 | 145 | 190 | 62.5 | 5.6 |
| 32A | 32 | 160 | 212 | 67.5 | 7.4 |
| 40A | 40 | 170 | 218 | 70.0 | 8.1 |
| 50A | 50 | 195 | 233 | 77.5 | 10.8 |

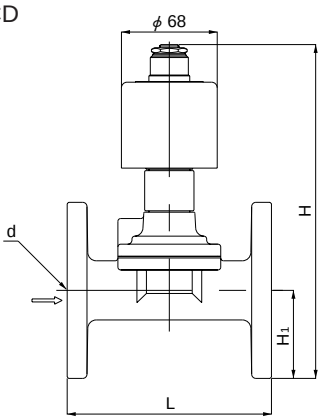
DP-13D




## ●DP-13CD

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 215 | 47.5 | 3.7 |
| 20A | 20 | 130 | 221 | 50.0 | 4.3 |
| 25A | 25 | 145 | 237 | 62.5 | 5.8 |
| 32A | 32 | 160 | 259 | 67.5 | 7.6 |
| 40A | 40 | 170 | 265 | 70.0 | 8.3 |
| 50A | 50 | 195 | 280 | 77.5 | 11.0 |

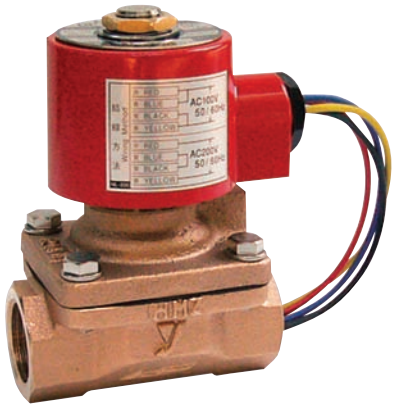
DP-13CD



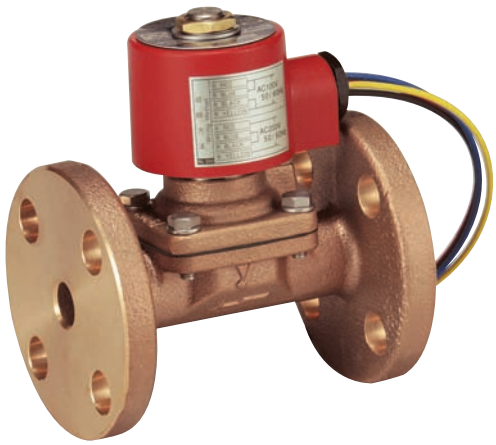
# DP-12·12-N
# DP-14·14-N Series

## Features

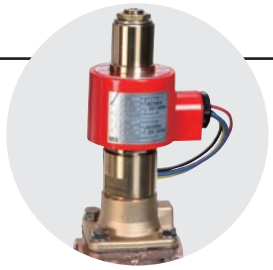
1. Zero working pressure, mainly used for gas and liquid.
2. Zero leakage due to synthetic rubber used for valve part.
3. Horizontal and vertical installation.



DP-12
DP-12-N



DP-14
DP-14-N



Normally opened type

DC coil type

### ●Diaphragm type Solenoid Valve

| Voltage and operation | AC voltage | | DC voltage | |
|---|---|---|---|---|
| | Normally closed | Normally opened | Normally closed | Normally opened |
| Screwed type | DP-12·12-N | DP-12C | DP-12D | DP-12CD |
| Flanged type | DP-14·14-N | DP-14C | DP-14D | DP-14CD |

## Specifications

| Model | AC coil | **DP-12·12-N** | **DP-14·14-N** | **DP-12C** | **DP-14C** |
|---|---|---|---|---|---|
| | DC coil | **DP-12D** | **DP-14D** | **DP-12CD** | **DP-14CD** |
| Application | | Air, Cold and hot water, Oil (20 cSt or less) | | | |
| Working pressure | | 0-1.0 MPa (unusable under vacuum) | | | |
| Min. differential pressure | | 0 MPa (0.1 MPa or more is required for vertical installation) | | | |
| Valve seat leakage | | No leakage at the pressure gauge | | | |
| Max. temperature | | 60˚C | | | |
| Operation | | Normally closed | | Normally opened | |
| Material | Body | Cast bronze * | | | |
| | Valve | NBR (diaphragm) | | | |
| Connection | | JIS Rc screwed | JIS 10K FF flanged | JIS Rc screwed | JIS 10K FF flanged |

* Available with leadless bronze (Non-Pb surface treatment) as the DP-12-N and DP-14-N.
・Available with FKM.
・Available with a terminal box (made of plastic).

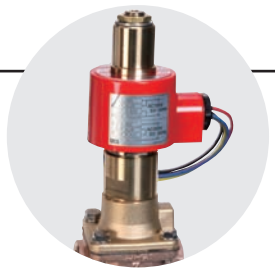
# DP-16·18 Series

## Features

1. Outstanding corrosion resistance ensured by stainless steel wetted parts.
2. High reliability for fluid.
3. Horizontal and vertical installation.
4. Compact, lightweight and large capacity.

DP-16

DP-18



Normally opened type

DC coil type

### ●Diaphragm type Solenoid Valve

| Voltage and operation | AC voltage | | DC voltage | |
|---|---|---|---|---|
| | Normally closed | Normally opened | Normally closed | Normally opened |
| Screwed type | DP-16 | DP-16C | DP-16D | DP-16CD |
| Flanged type | DP-18 | DP-18C | DP-18D | DP-18CD |

## Specifications

| Model | AC coil | **DP-16** | **DP-18** | **DP-16C** | **DP-18C** |
|---|---|---|---|---|---|
| | DC coil | **DP-16D** | **DP-18D** | **DP-16CD** | **DP-18CD** |
| Application | | Air, Cold and hot water, Oil (20 cSt or less) | | | |
| Working pressure | | 0-1.0 MPa (unusable under vacuum) | | | |
| Min. differential pressure | | 0 MPa (0.1 MPa or more is required for vertical installation) | | | |
| Valve seat leakage | | No leakage at the pressure gauge | | | |
| Max. temperature | | 60˚C | | | |
| Operation | | Normally closed | | Normally opened | |
| Material | Body | Cast stainless steel | | | |
| | Valve | NBR (diaphragm) | | | |
| Connection | | JIS Rc screwed | JIS 10K FF flanged | JIS Rc screwed | JIS 10K FF flanged |

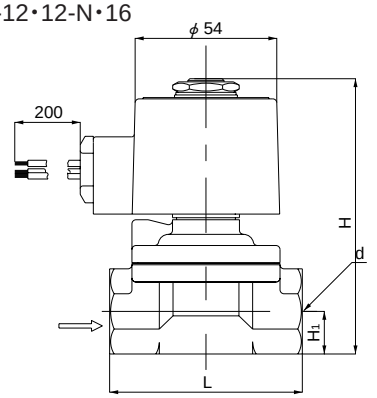
- Available with FKM.
- Available with a terminal box (made of plastic).

## Dimensions (mm) and Weights (kg)

### ●DP-12･12-N･16 (DP-16: 15A-50A)

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 109.5 | 14.5 | 1.1 |
| 15A | Rc 1/2 | 70 | 109.5 | 14.5 | 1.1 |
| 20A | Rc 3/4 | 80 | 116.5 | 17.5 | 1.3 |
| 25A | Rc 1 | 95 | 123.5 | 21.0 | 1.7 |
| 32A | Rc 1-1/4 | 110 | 150.5 | 26.0 | 2.5 |
| 40A | Rc 1-1/2 | 120 | 157.5 | 29.5 | 3.1 |
| 50A | Rc 2 | 140 | 172.5 | 36.5 | 5.0 |

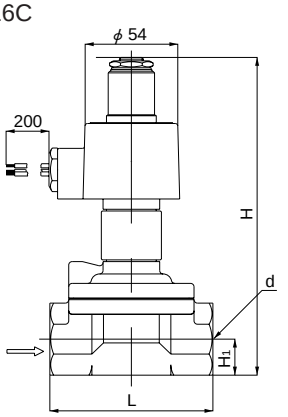
DP-12･12-N･16




### ●DP-12C･16C (DP-16C: 15A-50A)

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 172 | 14.5 | 1.4 |
| 15A | Rc 1/2 | 70 | 172 | 14.5 | 1.4 |
| 20A | Rc 3/4 | 80 | 179 | 17.5 | 1.6 |
| 25A | Rc 1 | 95 | 186 | 21.0 | 2.0 |
| 32A | Rc 1-1/4 | 110 | 213 | 26.0 | 2.8 |
| 40A | Rc 1-1/2 | 120 | 220 | 29.5 | 3.4 |
| 50A | Rc 2 | 140 | 235 | 36.5 | 5.3 |

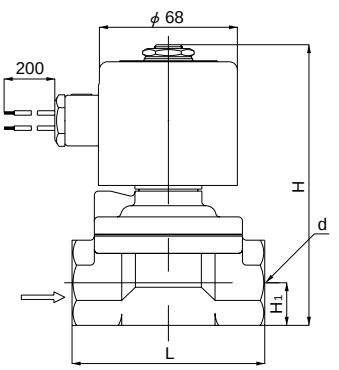
DP-12C･16C




### ●DP-12D･16D (DP-16D: 15A-50A)

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 124 | 14.5 | 1.9 |
| 15A | Rc 1/2 | 70 | 124 | 14.5 | 1.9 |
| 20A | Rc 3/4 | 80 | 131 | 17.5 | 2.1 |
| 25A | Rc 1 | 95 | 138 | 21.0 | 2.5 |
| 32A | Rc 1-1/4 | 110 | 166 | 26.0 | 3.3 |
| 40A | Rc 1-1/2 | 120 | 173 | 29.5 | 3.9 |
| 50A | Rc 2 | 140 | 187 | 36.5 | 5.8 |

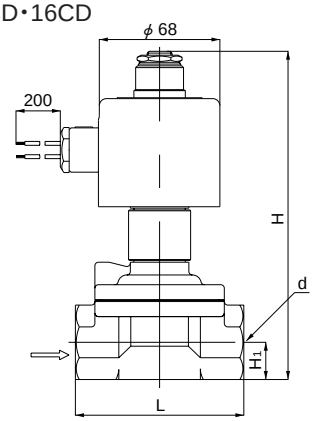
DP-12D･16D




### ●DP-12CD･16CD (DP-16CD: 15A-50A)

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 70 | 172 | 14.5 | 2.1 |
| 15A | Rc 1/2 | 70 | 172 | 14.5 | 2.1 |
| 20A | Rc 3/4 | 80 | 179 | 17.5 | 2.3 |
| 25A | Rc 1 | 95 | 186 | 21.0 | 2.7 |
| 32A | Rc 1-1/4 | 110 | 213 | 26.0 | 3.5 |
| 40A | Rc 1-1/2 | 120 | 220 | 29.5 | 4.1 |
| 50A | Rc 2 | 140 | 235 | 36.5 | 6.0 |

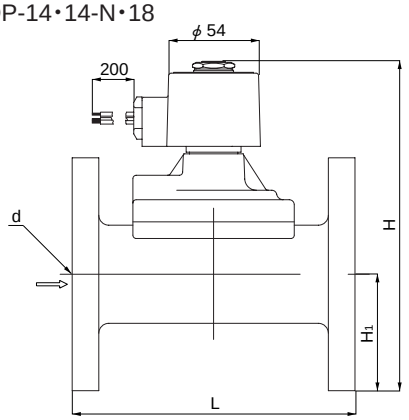
DP-12CD･16CD



## ●DP-14・14-N・18

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 142.5 | 47.5 | 2.6 |
| 20A | 20 | 130 | 149.0 | 50.0 | 3.2 |
| 25A | 25 | 145 | 165.0 | 62.5 | 4.7 |
| 32A | 32 | 160 | 192.0 | 67.5 | 6.5 |
| 40A | 40 | 170 | 198.0 | 70.0 | 7.2 |
| 50A | 50 | 195 | 213.0 | 77.5 | 9.9 |

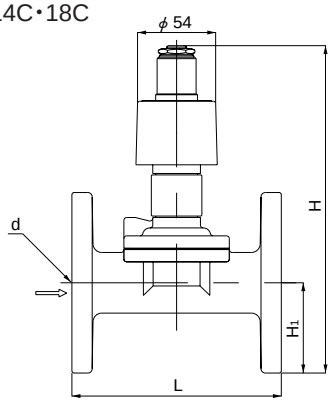
DP-14・14-N・18




## ●DP-14C・18C

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 205 | 47.5 | 2.9 |
| 20A | 20 | 130 | 212 | 50.0 | 3.5 |
| 25A | 25 | 145 | 228 | 62.5 | 5.0 |
| 32A | 32 | 160 | 255 | 67.5 | 6.8 |
| 40A | 40 | 170 | 261 | 70.0 | 7.5 |
| 50A | 50 | 195 | 276 | 77.5 | 10.2 |

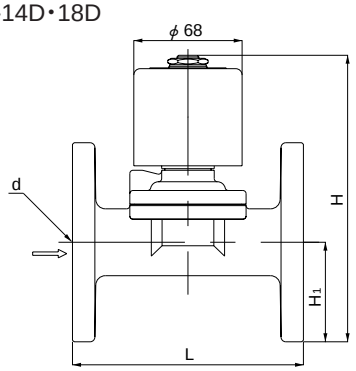
DP-14C・18C




## ●DP-14D・18D

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 157 | 47.5 | 3.4 |
| 20A | 20 | 130 | 164 | 50.0 | 4.0 |
| 25A | 25 | 145 | 180 | 62.5 | 5.5 |
| 32A | 32 | 160 | 207 | 67.5 | 7.3 |
| 40A | 40 | 170 | 213 | 70.0 | 8.0 |
| 50A | 50 | 195 | 228 | 77.5 | 10.7 |

DP-14D・18D

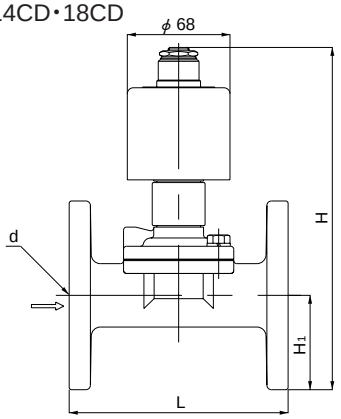



## ●DP-14CD・18CD

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 15A | 15 | 120 | 205 | 47.5 | 3.6 |
| 20A | 20 | 130 | 212 | 50.0 | 4.2 |
| 25A | 25 | 145 | 228 | 62.5 | 5.7 |
| 32A | 32 | 160 | 255 | 67.5 | 7.5 |
| 40A | 40 | 170 | 261 | 70.0 | 8.2 |
| 50A | 50 | 195 | 276 | 77.5 | 10.9 |

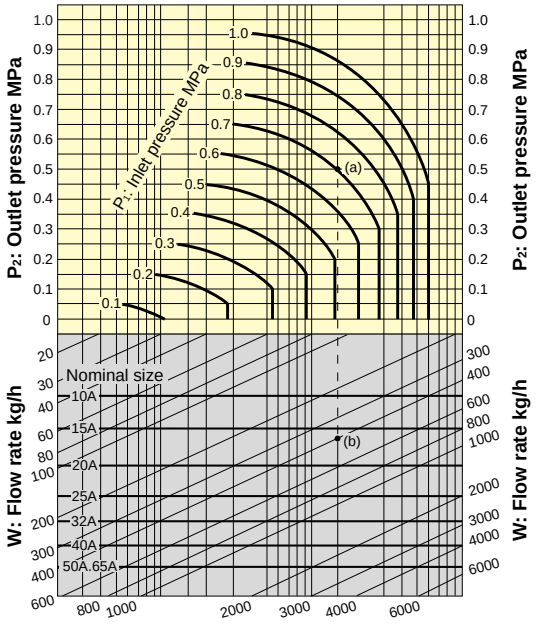
・The DP-18 Series is slightly heavier.

DP-14CD・18CD




・The DP-18 Series adopts a welded flange structure.

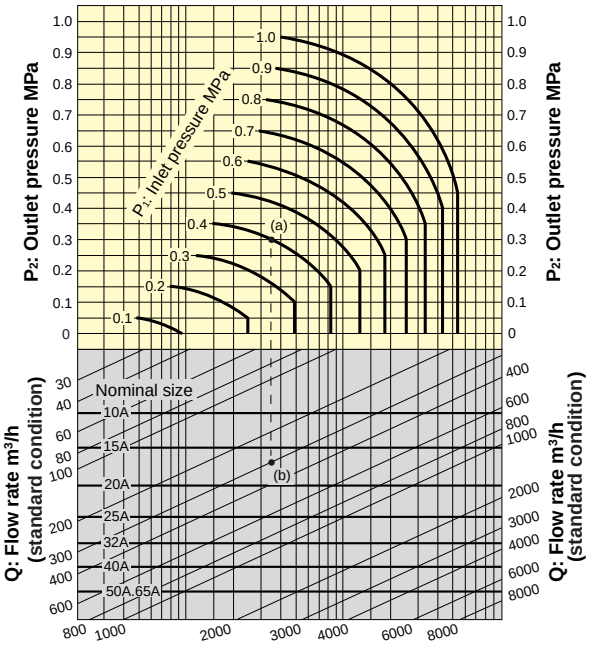
## Nominal Size Selection Chart (For Steam)




**How to use the chart**

When selecting the nominal size of a solenoid valve whose inlet pressure ($P_1$), outlet pressure ($P_2$), and steam (saturated steam) flow rate (W) are 0.7 MPa, 0.5 MPa, and 400 kg/h, respectively, first find intersection point (a) of $P_1$ = 0.7 MPa and $P_2$ = 0.5 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with W = 400 kg/h. Since this intersection point (b) lies between nominal sizes 15A and 20A, select the larger one, 20A.

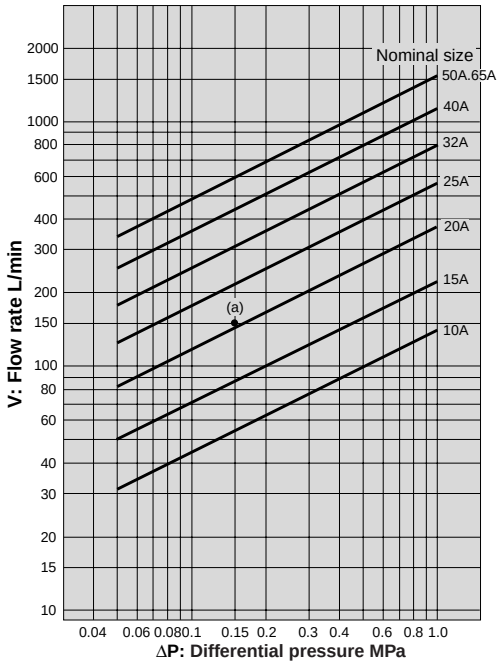
## Nominal Size Selection Chart (For Air)




**How to use the chart**

When selecting the nominal size of a solenoid valve whose inlet pressure ($P_1$), outlet pressure ($P_2$), and air (20˚C) flow rate (Q) are 0.4 MPa, 0.3 MPa, and 300 m³/h (standard condition), respectively, first find intersection point (a) of $P_1$ = 0.4 MPa and $P_2$ = 0.3 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with Q = 300 m³/h (standard condition). Since this intersection point (b) lies between nominal sizes 15A and 20A, select the larger one, 20A.

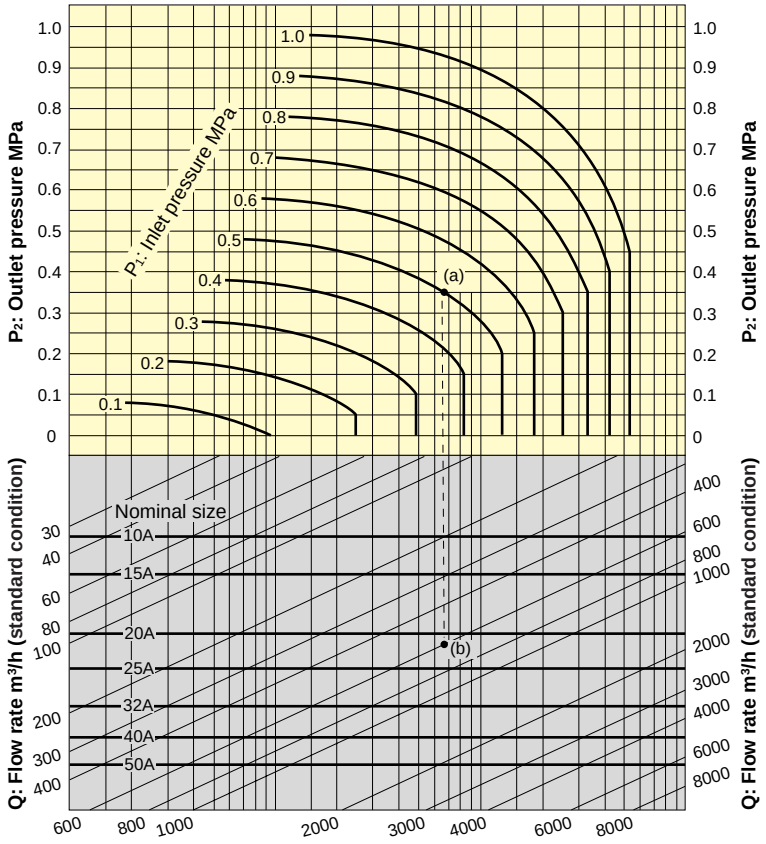
## Nominal Size Selection Chart (For Water)




**How to use the chart**

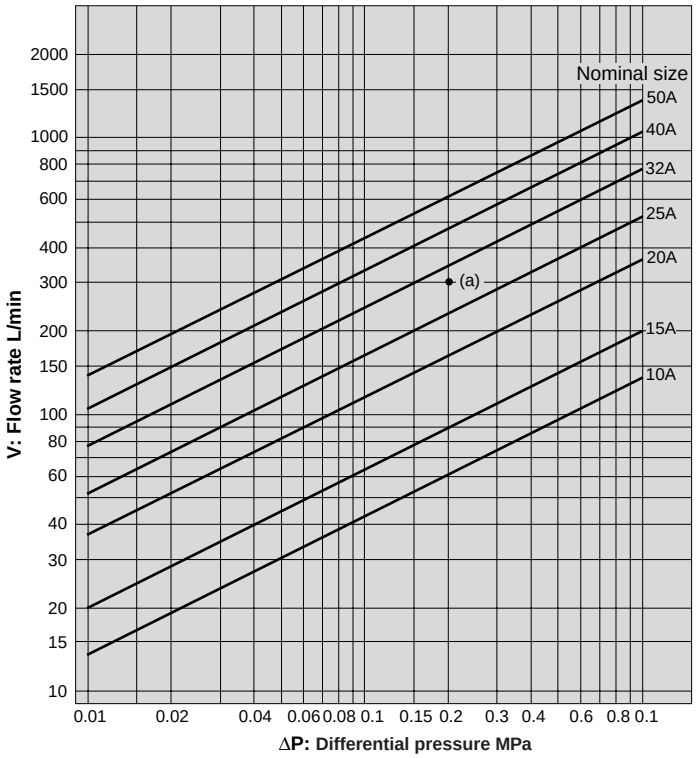
When selecting the nominal size of a solenoid valve whose inlet pressure ($P_1$), outlet pressure ($P_2$), and flow rate (V) are 0.5 MPa, 0.35 MPa, and 150 L/min, respectively, first find intersection point (a) of the differential pressure before and after the valve [$\Delta P$ = 0.5 – 0.35 = 0.15 MPa] and V = 150 L/min. Since this intersection point (a) lies between nominal sizes 20A and 25A, select the larger one, 25A.

## Nominal Size Selection Chart (For Air)




**How to use the chart**
When selecting the nominal size of a solenoid valve whose inlet pressure ($P_1$), outlet pressure ($P_2$), and air (20˚C) flow rate (Q) are 0.5 MPa, 0.35 MPa, and 600 m³/h (standard condition), respectively, first find intersection point (a) of $P_1$ = 0.5 MPa and $P_2$ = 0.35 MPa. Trace down vertically from this intersection point (a) to find intersection point (b) with Q = 600 m³/h (standard condition). Since this intersection point (b) lies between nominal sizes 20A and 25A, select the larger one, 25A.

## Nominal Size Selection Chart (For Water)




**How to use the chart**
When selecting the nominal size of a solenoid valve whose inlet pressure ($P_1$), outlet pressure ($P_2$), and flow rate (V) are 0.7 MPa, 0.5 MPa, and 300 L/min, respectively, first find intersection point (a) of the differential pressure before and after the valve [ΔP = 0.7 – 0.5 = 0.2 MPa] and V = 300 L/min. Since this intersection point (a) lies between nominal sizes 25A and 32A, select the larger one, 32A.

# DD-2•3

## Features

1. Outstanding corrosion resistance achieved by adopting stainless steel for major parts and body.
2. Significantly improved corrosion resistance with stainless steel made body and trim parts.
3. Easy maintenance due to gasket made of PTFE.
4. RoHS-compliant product.
5. Various installation postures: Vertical or horizontal including intermediates.
6. Equipped with coil of AC 100 / 200 V selective and common for 50 Hz / 60 Hz.


## Specifications

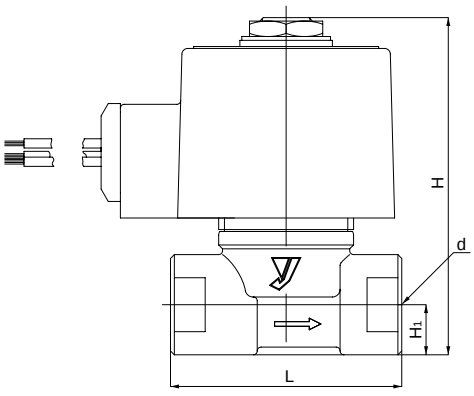
| Model | | DD-2 | DD-2-8 | DD-3 | DD-3-8 |
|---|---|---|---|---|---|
| Application | | Steam, Air, Cold and hot water, $N_2$ gas, $CO_2$ gas (dry), Ar gas, Oil | | Air, Cold and hot water, $N_2$ gas, $CO_2$ gas (dry), Ar gas, Oil | |
| Fluid viscosity | | 20 cSt or less | | | |
| Working pressure | | 0-0.15 MPa | 0-0.8 MPa | 0-0.15 MPa | 0-0.8 MPa |
| Orifice (mm) | | 9.5 | 4.0 | 9.5 | 4.0 |
| Cv value | | 1.7 | 0.55 | 1.7 | 0.55 |
| Allowable valve seat leakage | | 50 mL/min under standard conditions | | No leakage at the pressure gauge | |
| Max. temperatue | | 175˚C | | 100˚C | |
| Operation | | Normally closed | | | |
| Material | Body | Cast stainless steel (SCS14A) | | | |
| | Plunger | Stainless steel | | | |
| | Valve disc | PTFE | | FKM | |
| Connection | | JIS Rc screwed | | | |

## Specification of Coil

| | | |
|---|---|---|
| Rated voltage | AC 100 / 200 V selective type | AC 110 / 220 V selective type |
| | 50 / 60 Hz common | |
| Allowable fluctuation | Rated voltage ± 10% | |
| Rated current | 0.42 / 0.21 A | 0.38 / 0.19 A |
| Starting current | 1.10 / 0.55 A | 1.00 / 0.50 A |
| Insulation class | Insulation class H | |
| Protective structure | Dust proof, Splash proof | |
| Ingress protection code | IP64 (JIS C0920) | |
| Insulation resistance | 500 MΩ and more / 500V megger | |
| Withstand voltage test | 1500 V/min | |

## Dimensions (mm) and Weights (kg)

| Nominal size | d | L | H | $H_1$ | Weight |
|---|---|---|---|---|---|
| 10A | Rc 3/8 | 50 | 85.5 | 12 | 0.66 |
| 15A | Rc 1/2 | 60 | 87.5 | 13 | 0.69 |
| 20A | Rc 3/4 | 65 | 91 | 16.5 | 0.74 |



# DD-1S·1W

## Features

1. Usable for air, water, oil (viscosity: up to 20 cSt) and steam.
2. Horizontal and vertical installation.
3. Large orifice diameter provides a high flow rate (Cv value).
4. Coil protective structure complies with the splashproof requirements specified in JIS C 0920.
5. Available with AC 100V 50/60 Hz (selective) type and AC 200V 50/60 Hz (selective) type.

## Specification of coil

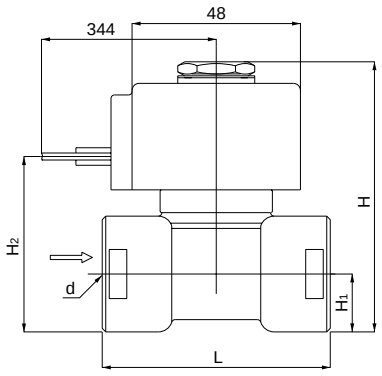
| | | |
|---|---|---|
| Rated voltage | AC 100 V 50 / 60 Hz Selective | AC 200 V 50 / 60 Hz Selective |
| Allowable fluctuation | Rated voltage ± 10% | |
| Rated current | 0.22 / 0.26 A | 0.11 / 0.13 A |
| Starting current | 0.56 / 0.67 A | 0.27 / 0.32 A |
| Insulation class | Insulation class H | |
| Protective structure | Dust proof, Splash proof | |
| Insulation resistance | 500 MΩ and more / 500 V megger | |
| Withstand voltage test | 1500 V/min | |


## Specifications

| Model | | DD-1S | DD-1S-5 | DD-1S-7 | DD-1W | DD-1W-5 | DD-1W-7 |
|---|---|---|---|---|---|---|---|
| Application | | Steam | | | Air, Cold and hot water, Oil | | |
| Fluid viscosity | | 20 cSt or less | | | | | |
| Working pressure | | 0-0.12 MPa | 0-0.5 MPa | 0-0.7 MPa | 0-0.12 MPa | 0-0.5 MPa | 0-0.7 MPa |
| Orifice (mm) | | 9.5 | 5.0 | 4.0 | 9.5 | 5.0 | 4.0 |
| Flow rate coefficient (Cv) | | 1.7 | 0.75 | 0.55 | 1.7 | 0.75 | 0.55 |
| Max. temperature | | 120˚C | 160˚C | 170˚C | 120˚C | | |
| Rated voltage | | AC 100 V 50 / 60 Hz·AC 200 V 50 / 60 Hz Selective | | | | | |
| Operation | | Normally closed | | | | | |
| Material | Body | Cast bronze | | | | | |
| | Plunger | Stainless steel | | | | | |
| | Valve disc | PTFE | | | FKM | | |
| Connection | | JIS Rc screwed | | | | | |

## Dimensions (mm) and Weights (kg)

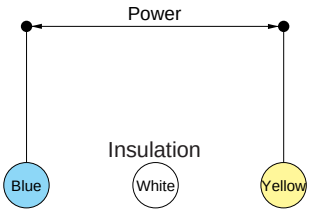
| Nominal size | d | L | H | $H_1$ | $H_2$ | Weight |
|---|---|---|---|---|---|---|
| 10A | Rc 3/8 | 50 | 70 | 11 | 41 | 0.45 |
| 15A | Rc 1/2 | 55 | 74 | 13 | 45 | 0.48 |
| 20A | Rc 3/4 | 65 | 80 | 16.5 | 51 | 0.53 |



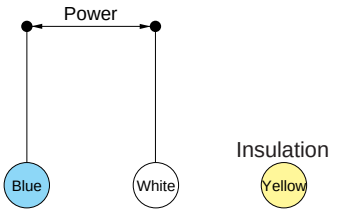
## Wire Connecting Method

Wire connecting method differs between the 50 Hz and 60 Hz types. Connect the wires of the coil as specified below.

For 100 / 200V 50Hz
Connect the "blue" and "yellow" wires to the power supply. Insulate the "white" wire (by taping or fixing it to the terminal, etc.).

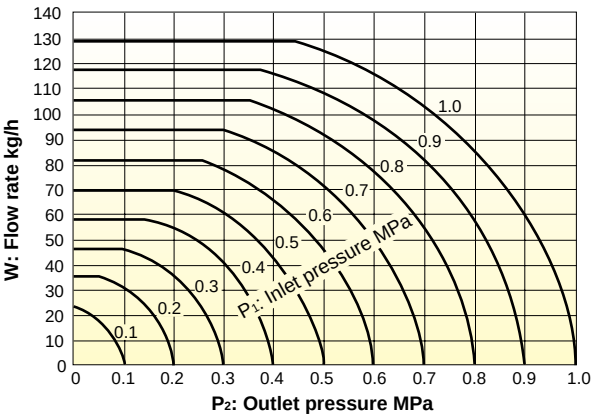



For 100 / 200V 60Hz
Connect the "blue" and "white" wires to the power supply. Insulate the "yellow" wire (by taping or fixing it to the terminal, etc.).

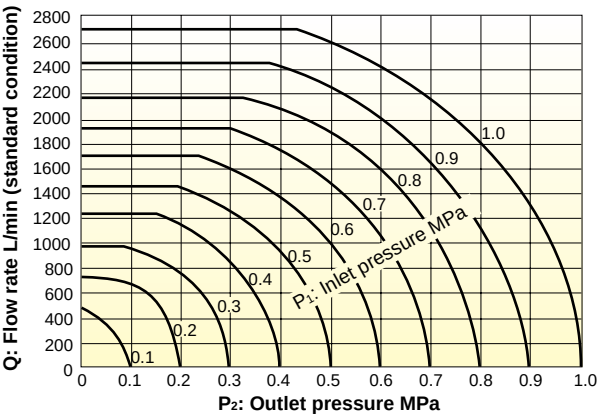



## Nominal Size Selection Chart

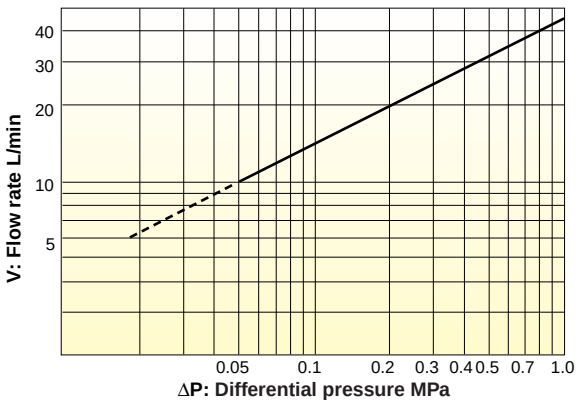
### ●Fluid: Saturated steam (Cv: 1)




### ●Fluid: Air (Cv: 1)




### ●Fluid: Water (Cv: 1)




**How to calculate the flow rate**

The steam, air, and water flow rate charts show the flow rates when Cv = 1. To calculate the flow rate of each model, multiply the value by the Cv value of the model.

(Example)

Calculating the amount of water when a DD-1W-5 20A valve is used and its inlet and outlet pressures are 0.4 MPa and 0.3 MPa. When the differential pressure before and after the valve is [ΔP = 0.4 – 0.3 = 0.1 MPa], the amount of water is 15 L/min as shown in the left figure.

15 L/min (from the chart of water) x 0.75 (Cv value) = 11.25 L/min

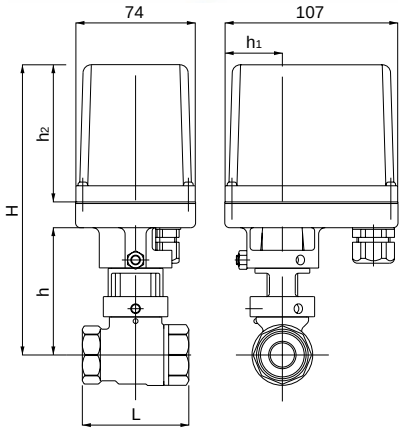
# MD-54

## Features

1. IP65 dust and water proof structure (JIS C 0920).
2. Excellent durability by built-in thermal protector (no motor burnout).
3. Quickly accurate starting/stopping operation. The indication of the working position can be checked.
4. Valve disc smoothly opens and closes, preventing water hammer and ensuring complete sealing.
5. Manually operable.
6. Equipped with opening-closing indicator lamp circuit.
7. Incorporated space heater for dew condensation prevention (1W).

## Specifications

| | | | | |
|---|---|---|---|---|
| Application | | Steam, Air, Cold and hot water | | |
| Working pressure | | Steam: 0-0.6 MPa<br>Air, Cold and hot water: 0-1.0 MPa | | |
| Application temperature | | Steam: Max. 160˚C Air: Max. 120˚C<br>Cold and hot water: Max. 100˚C | | |
| Ambient temperature | | –15 – 55˚C | | |
| Rated voltage | | AC 100 / 110 V 50 / 60 Hz common<br>AC 200 / 220 V 50 / 60 Hz common | | |
| Power consumption | | Nominal size 15A-32A | Nominal size 40A・50A | |
| | | 16 VA | 19 VA | |
| Operation | | ON-OFF | | |
| Operation angle | | 90˚ | | |
| Opening and closing time | | Nominal size 15A・20A | Nominal size 25A・32A | Nominal size 40A・50A |
| | | 5.4 sec. (50 Hz) 4.5 sec (60 Hz) | 15.5 sec. (50 Hz) 13 sec. (60 Hz) | 16 sec. (50 Hz) 13.5 sec. (60 Hz) |
| Percentage duty cycle | | 20% 15 min. | | |
| Manual operation | | Possible | | |
| Overcurrent protection | | Built-in thermal protector | | |
| Indicator lamp circuit | | Built-in | | |
| Protective structure | | IP65 dust and water proof structure (JIS C 0920) | | |
| Valve shape | | Reduced bore | | |
| Material | Body | Cast stainless steel | | |
| | Ball | Stainless steel | | |
| | Seat | Reinforced fluorine resin for high temperature | | |
| Connection | | JIS Rc screwed | | |



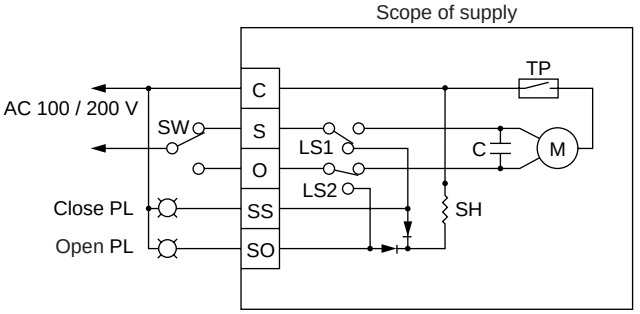

## Dimensions (mm) and Weights (kg)

| Nominal size | L | H | h | $h_1$ | $h_2$ | Bore | Weight |
|---|---|---|---|---|---|---|---|
| 15A | 59 | 178 | 52 | 36 | 85 | 13 | 1.4 |
| 20A | 66 | 180 | 54 | 36 | 85 | 15 | 1.5 |
| 25A | 78 | 187 | 61 | 36 | 85 | 20 | 1.7 |
| 32A | 87 | 197 | 71 | 36 | 85 | 25 | 2.0 |
| 40A | 95 | 218 | 77 | 53 | 85 | 32 | 2.8 |
| 50A | 109 | 224 | 83 | 53 | 85 | 40 | 3.3 |

### ●Cv value

| Nominal size | Cv value |
|---|---|
| 15A | 9 |
| 20A | 13 |
| 25A | 24 |
| 32A | 44 |
| 40A | 80 |
| 50A | 120 |

## Circuit of Motor Operation




LS1: Close-limit SW LS2: Open-limit SW SH: Space heater
TP: Thermal protector C: Condenser M: Motor

# MD-36R

## Features

1. Outdoor, rainproof structure (IP64 specified in JIS C 0920).
2. Starts and stops are quick and accurate, and the indication of the working position can be checked.
3. Smoothly opens and closes, preventing water hammer by the fluid and ensuring complete sealing.
4. Manually operable.
5. A space heater is incorporated to prevent dew condensation (0.5 W).
6. Superior in durability: no motor burnout by function of the timer for motor protection.

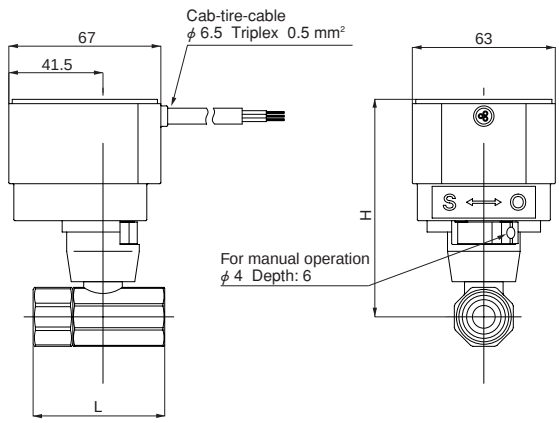
## Specifications

| | | |
|---|---|---|
| Application | | Air, Cold and hot water |
| Working pressure | | 0-1.0 MPa |
| Application temperature | | –10 – 80˚C (no freeze condition) |
| Ambient temperature | | –20 – 50 (60) ˚C * |
| Rated voltage | | AC 100 / 110 V 50 / 60 Hz common<br>AC 200 / 220 V 50 / 60 Hz common |
| Power consumption | | 8 VA |
| Operation | | ON-OFF |
| Operation angle | | 90-degree positive, inverse rotation |
| Opening and closing time | | About 6-8 seconds |
| Percentage duty cycle | | 20% 15 min. |
| Manual operation | | Possible |
| Protective structure | | Rainproof structure at the outdoor |
| Valve shape | | Reduced bore |
| Material | Body | Brass |
| | Ball | Brass (HCr plating) |
| | Seat | PTFE |
| Connection | | JIS Rc screwed |

* The ambient temperature of 60˚C depends on the frequency of operation and the temperature of the fluid. Please contact us.


## Dimensions (mm) and Weights (kg)

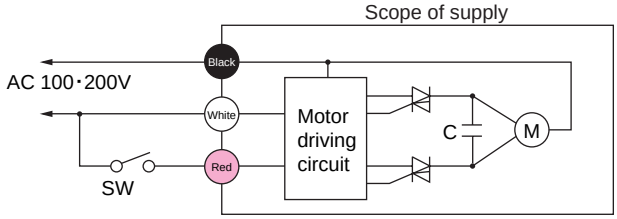
| Nominal size | L | H | Bore | Weight |
|---|---|---|---|---|
| 15A | 58 | 96 | 10 | 1.1 |
| 20A | 63 | 98 | 12.5 | 1.1 |
| 25A | 71 | 102 | 15 | 1.2 |




### ●Cv value

| Nominal size | Cv value |
|---|---|
| 15A | 6 |
| 20A | 11 |
| 25A | 15 |

## Connecting Diagram

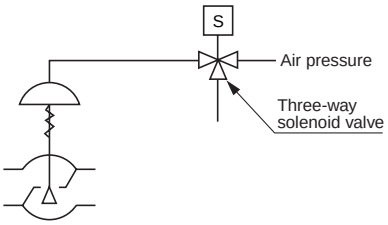



When SW is OFF, the valve closes.
When SW is ON, the valve opens.
Note) This valve may not be available if the switch is semiconductor such as triac.

# PD-1・2

## Features

1. Usable for air, water, oil and steam.
2. No chattering due to closing action against the flow direction of fluid.
3. Excellent durability of stainless steel valve seat.
4. Excellent durability of synthetic rubber diaphragm.




PD-1

## Specifications

| Model | | PD-1 | PD-2 |
|---|---|---|---|
| Application | | Steam, Air, Cold and hot water, Other non-dangerous fluids | |
| Working pressure | | 0-1.0 MPa | |
| Max.temperature | | 180˚C | |
| Operation | | Air-to-open | |
| Operation pressure | | 0.2-0.25 MPa | |
| Material | Body | Cast bronze | Cast iron |
| | Valve | Stainless steel | |
| | Valve seat | Stainless steel | |
| Connection | | JIS Rc screwed | JIS 10K FF flanged |

・Available with air-to-close operation type.

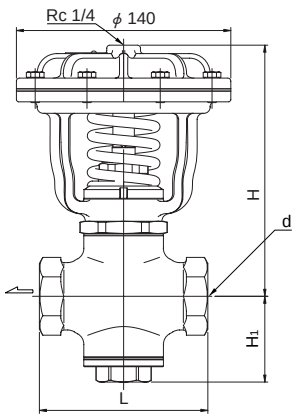
## Dimensions (mm) and Weights (kg)

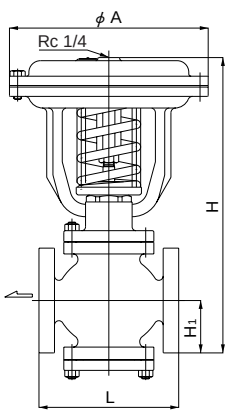
●PD-1

| Nominal size | d | L | H | $H_1$ | Cv value | Weight |
|---|---|---|---|---|---|---|
| 15A | Rc 1/2 | 90 | 210 | 50 | 5 | 4 |
| 20A | Rc 3/4 | 100 | 221 | 56 | 7 | 4.4 |
| 25A | Rc 1 | 110 | 221 | 56 | 11 | 4.7 |

●PD-2

| Nominal size | L | H | $H_1$ | $\phi$ A | Cv value | Weight |
|---|---|---|---|---|---|---|
| 15A | 120 | 210 | 50 | 140 | 5 | 5.9 |
| 20A | 130 | 221 | 56 | 140 | 7 | 6.6 |
| 25A | 140 | 221 | 56 | 140 | 11 | 8.1 |
| 32A | 180 | 412 | 100 | 256 | 16 | 28.5 |
| 40A | 180 | 412 | 100 | 256 | 24 | 29.0 |
| 50A | 180 | 422 | 105 | 256 | 40 | 30.0 |



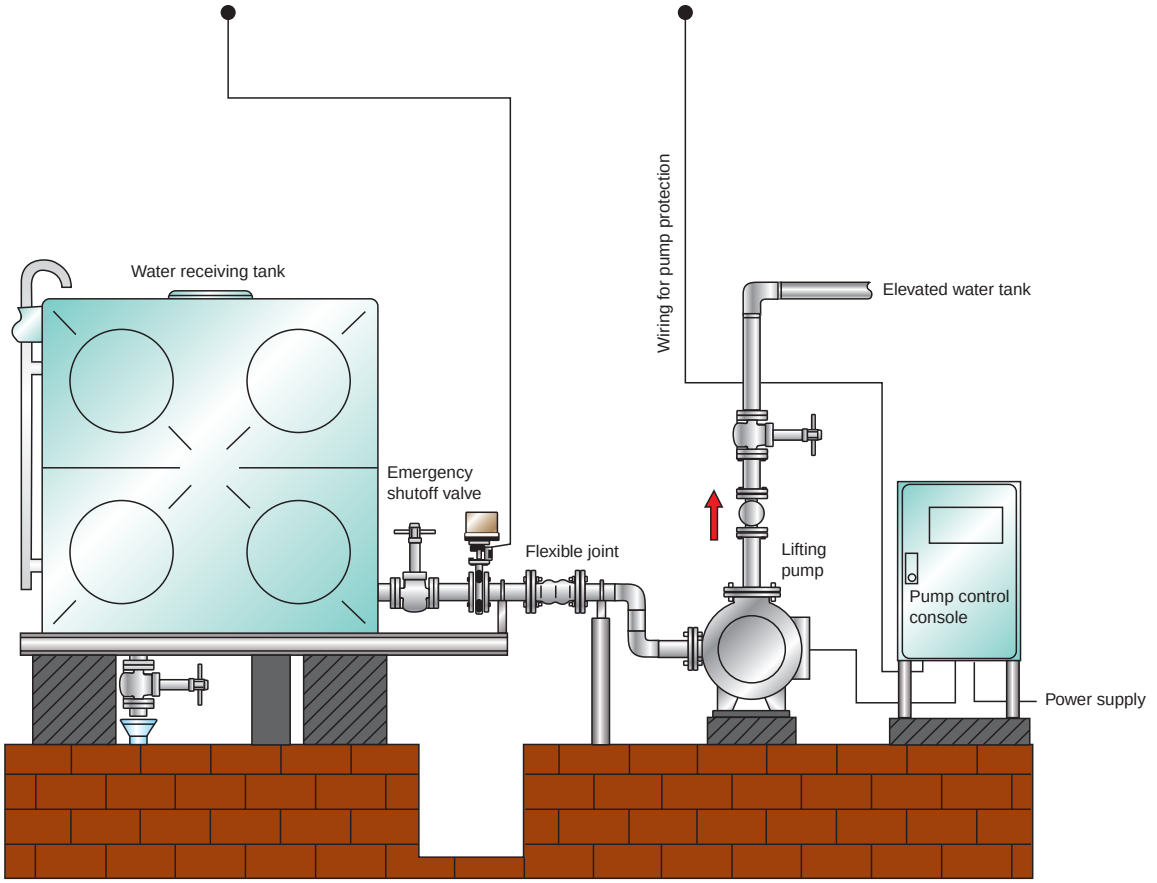
# MD-71・KS-5

## What is an Emergency Shutoff System?

If a piping system is damaged by a big earthquake, important water for living stored in a water receiving tank or gravity water tank will be lost. It is, therefore, necessary to prevent the interruption of lifelines and reserve water for living after the disaster. Additionally, national standards and guidelines stress the necessity of “emergency shutoff valves” for the purpose of preserving water. Yoshitake's emergency shutoff system comprises an “emergency shutoff valve” and an “emergency shutoff valve control console” and is designed to automatically close the valve when the earthquake sensor inside the control console works. It is capable of supplying water for living reserved in the water receiving tank or gravity water tank even after a disaster.

MD-71 Emergency shutoff valve

KS-5 Emergency shutoff valve control console



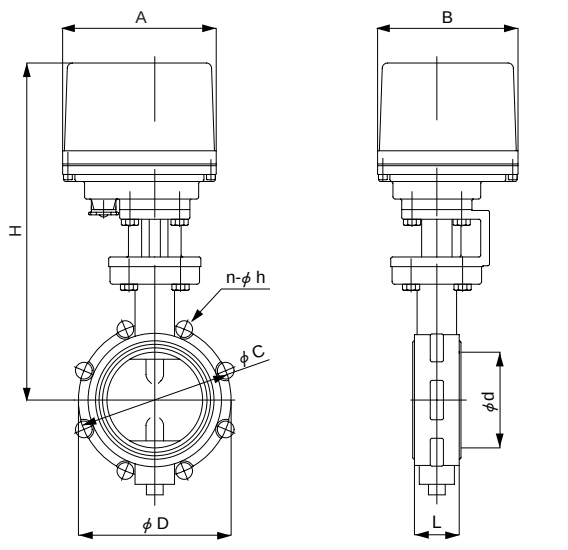
## Specifications and Structure of MD-71

| | | |
|---|---|---|
| Model | | MD-71 (butterfly valve) |
| Application | | City water |
| Applicable pressure | | 0-1.0 MPa |
| Applicable fluid temperature | | 5-60˚C |
| Installation posture | | Can be installed in any posture, from upright to sideways to horizontal piping. |
| Opening-closing time | | 50A and 65A: 4 or fewer seconds, 80A and 100A: 10 or fewer seconds,<br>125A and 150A: 15 or fewer seconds, 200A: 45 or fewer seconds |
| Actuator | Rated voltage | 24 V DC |
| | Power consumption | 50-100A: MAX. 80 VA 125-200A: MAX.120 VA |
| | Ambient temperature | –20 – 55˚C (no freeze condition) |
| | Measure against dew condensation | Space heater contained |
| | Manual operation | Manual operation mechanism provided |
| | Protective structure | Outdoor rainproof structure (JIS C 0920 IP65) |
| | Wire lead-in port | G 1/2 |
| Material | Body | Cast iron (FC 300) |
| | Valve | Stainless steel |
| | Seat | FKM |
| Connection | | JIS 10K flanged |

・Please contact us when using for fluid other than city water.

## Dimensions (mm) and Weights (kg)

| Nominal size | d | L | H | D | A | B | JIS 10K flanged | | Weight |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | C | n-h | |
| 50A | 52 | 41 | 332 | 115 | 175 | 160 | 120 | 4-19 | 7.7 |
| 65A | 64 | 44 | 349 | 135 | 175 | 160 | 140 | 4-19 | 9.2 |
| 80A | 78 | 44 | 356 | 145 | 175 | 160 | 150 | 8-19 | 9.7 |
| 100A | 103 | 51 | 384 | 175 | 175 | 160 | 175 | 8-19 | 12 |
| 125A | 129 | 54 | 406 | 206 | 175 | 160 | 210 | 8-23 | 15 |
| 150A | 154 | 54 | 419 | 231 | 175 | 160 | 240 | 8-23 | 16 |
| 200A | 205 | 64 | 501 | 290 | 217.5 | 175 | 290 | 12-23 | 30 |




・The shape of the 200A is partly different from the figure.

## Cv Value and Calculation Formula

| 50A | 65A | 80A | 100A | 125A | 150A | 200A |
|---|---|---|---|---|---|---|
| 159 | 266 | 457 | 860 | 1320 | 2020 | 3540 |

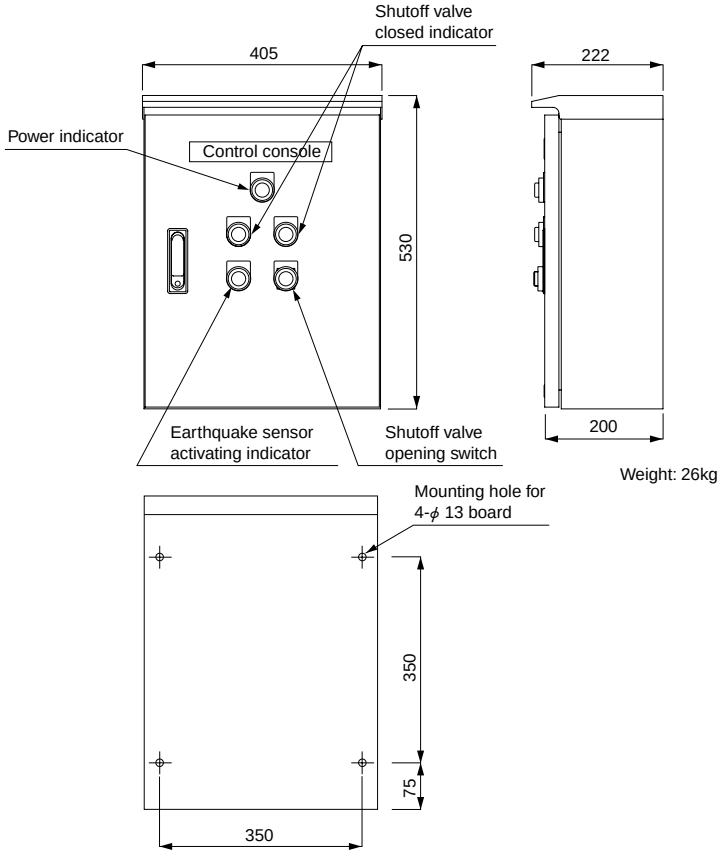
$$Cv = \frac{0.365\,V\sqrt{G}}{\sqrt{\Delta P}}$$

$P_1$: Inlet pressure [MPa・A]
$P_2$: Outlet pressure [MPa・A]
$\Delta P$: $P_1 - P_2$ [MPa]
G : Specific gravity (against water)
V : Max. flow rate of fluids
Cv: Cv value of each nominal size

## Specifications and Structure of KS-5

| Model | | KS-5 |
|---|---|---|
| Number of emergency shutoff valves to be controlled | | 2 *1 |
| Supply power source | | 85-240 V AC, 50 / 60 Hz |
| Ambient temperature | | -10 - 50°C |
| Backup power source | | 24 V DC |
| Backup time | | Approx. 5 hours |
| Storage battery | | Storage battery manufactured by Japan Storage Battery (PE 12 V 2.2) |
| Charging method | | Constant charging method (float charging) |
| Measure against lightning | | Surge absorber provided |
| Output terminal | For emergency shutoff valve control | 24 V DC |
| | For pump protection | No-voltage c-contact (one c-contact) *2 |
| | For earthquake sensor external warning | No-voltage a-contact (one a-contact) (ON contact when the earthquake sensor is working) |
| | For power external warning | No-voltage a-contact (one a-contact) (ON contact when the power inside the control console unusually drops) |
| Shutoff valve opening switch | | Pushbutton switch for resetting provided |
| Earthquake sensor | Detection direction | All horizontal directions |
| | Set acceleration | 200 Gal (equal to 5 upper in Japan Meteorological Agency's seismic intensity) |
| Installation location | | Indoor and outdoor (equal to JIS C 0920 IP44) |
| Installation method | | Wall-hung type |

*1 Available with for controlling one, three or four emergency shutoff valve(s).
*2 It is different when controlling three or four emergency shutoff valves.

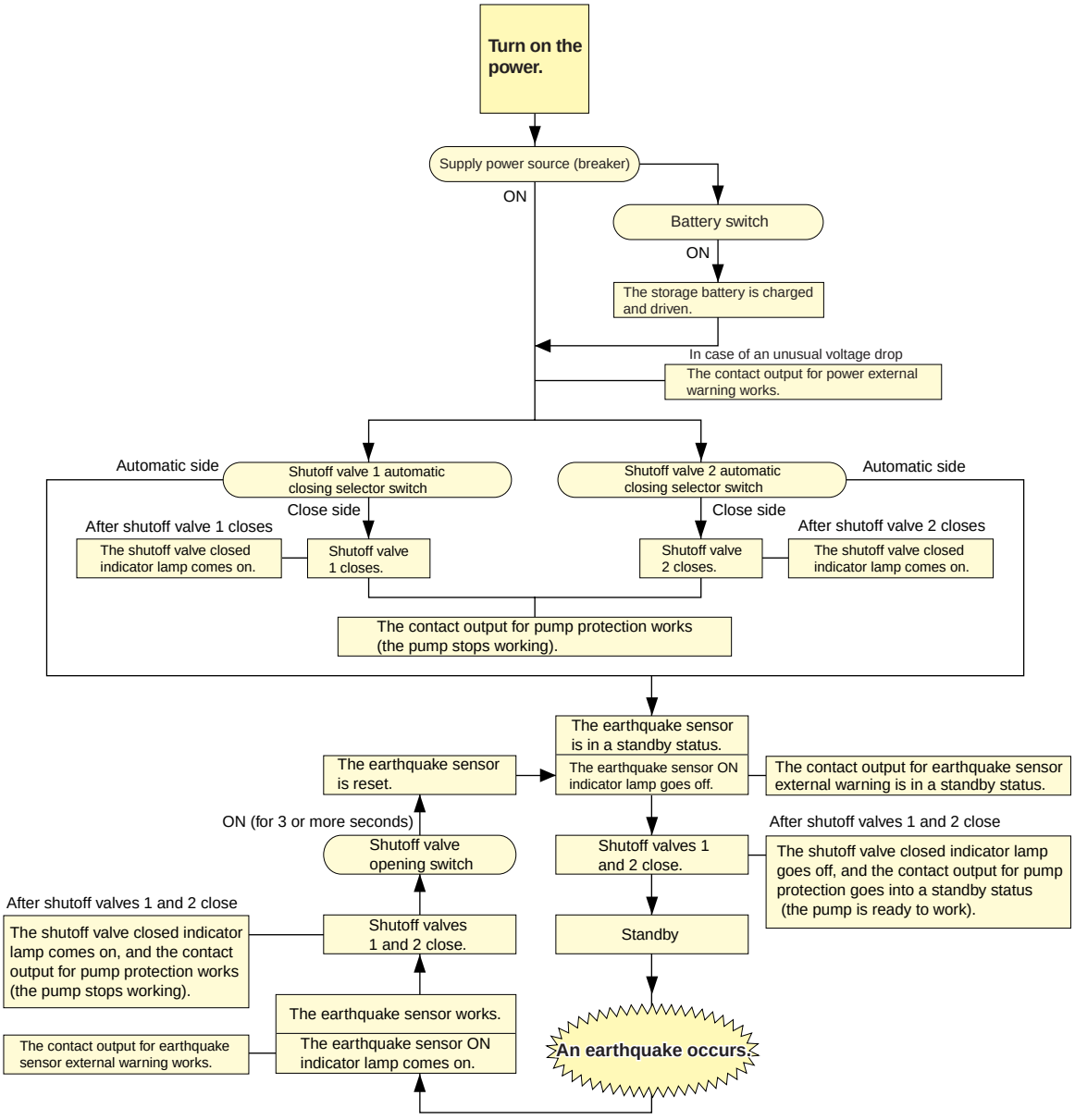



・The figure shown above is a control console for controlling two emergency shutoff valves. The shapes of control consoles for controlling one, three, and four emergency shutoff valves are slightly different.

**Reference** **What is Gal ...?**

One Gal is defined as an acceleration of 1 centimeter per second (1 cm/s) per second. That is, the gal can also be expressed as 1 centimeter per second squared (1 $cm/s^2$). In the International System of Units (SI), the unit of acceleration is meter per second squared ($m/s^2$), and 1 Gal is equal to 0.01 $m/s^2$.
Although the gal is a non-SI unit, Japan's Measurement Law permits the use of Gal and Milligal (mGal) only for the measurement of gravitational acceleration as well as vibration acceleration regarding earthquakes.

# Operation Flowchart (for Controlling Two Shutoff Valves)




## Features

1. An earthquake sensor (acceleration: 200 Gal) is installed inside the control console that automatically works in case of an earthquake (the shutoff valves close in intensity 5 upper).
2. The control console properly works with the backup power source even in case of a power failure.
3. The pump instantly stops when the shutoff valves close (this requires wiring between the interlock terminal of the emergency shutoff valve control console and that of the pump control console).
4. Resetting after a shutoff is easy just by pressing the shutoff valve opening switch.
5. The control console can be manually operated.

| Feature | | Pressure & flame proof solenoid valve | | Motor valve / Screwed, 2 way |
|---|---|---|---|---|
| **Model** | | **DP-34** | | **MD-53** |
| **Picture** | |  | |  |
| **Application** | | **Air, Nitrogen gas** | **Cold and hot water, Heavy oil A, Light oil** | **Air, Cold and hot water** |
| Working pressure | | 0.05-0.9 MPa (unusable under vacuum) | 0.05-1.6 MPa (unusable under vacuum) | 0-1.0 MPa |
| Min. differential pressure | | 0.05 MPa | | — |
| Application temperature | | 5-60˚C | | –15 – 80˚C (no freeze condition) |
| Ambient temperature | | 5-60˚C | | –15 – 55˚C |
| Rated voltage | | AC 100 V 50 / 60 Hz common<br>AC 200 V 50 / 60 Hz common | | AC 100 / 110 V 50 / 60 Hz common<br>AC 200 / 220 V 50 / 60 Hz common |
| Operation | | Normally closed | | ON-OFF |
| Connection | | JIS Rc screwed | | JIS Rc screwed |
| Material | Body | Brass (C3771) | | Cast stainless steel |
| | Main valve | Brass (C3604) | | — |
| | Valve disc | Fluororubber (FKM) | | — |
| | Ball | — | | Stainless steel |
| | Seat | — | | PTFE |
| Size | | 15A-25A | | 15A-50A |
| Others | | — | | — |

| Feature | | Motor valve / Screwed, 3 way | Motor valve / Flanged, 2 way | Motor valve / Stainless steel, 2 way |
|---|---|---|---|---|
| **Model** | | **MD-35R** | **MD-55** | **MD-61** |
| **Picture** | |  |  |  |
| **Application** | | **Air, Cold and hot water** | **Air, Cold and hot water** | **Air, Cold and hot water** |
| Working pressure | | 0-1.0 MPa | 0-1.0 MPa | 0-1.0 MPa |
| Min. differential pressure | | — | — | — |
| Application temperature | | –10 – 80˚C (no freeze condition) | 0-80˚C | 0-80˚C |
| Ambient temperature | | –20 – 50 (60)˚C * | –20 – 50˚C | –20 – 50˚C |
| Rated voltage | | AC 100 / 110 V 50 / 60 Hz common<br>AC 200 / 220 V 50 / 60 Hz common | AC 100 / 110 V 50 / 60 Hz common<br>AC 200 / 220 V 50 / 60 Hz common | AC 100 / 110 V 50 / 60 Hz common<br>AC 200 / 220 V 50 / 60 Hz common |
| Operation | | Diverting | ON-OFF | ON-OFF |
| Connection | | A・B: JIS Rc screwed<br>C: JIS R screwed | JIS 10K RF flanged | JIS 10K RF flanged |
| Material | Body | Brass | Ductile cast iron | Cast stainless steel |
| | Ball | Brass (HCr plating) | Stainless steel | Stainless steel |
| | Seat | PTFE | PTFE | PTFE |
| Size | | 15A-25A | 65A-150A | 65A-125A |
| Others | | * The ambient temperature of 60˚C depends on the frequency of operation and the temperature of the fluid. Please contact us. | — | — |